THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXVI.—No. 7. Whole No. 1,132. | NEW YORK, MONDAY, FEBRUARY 15, 1897. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Terms of Subscription, Including Postage—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION, OFFICE OF SECRETARY, NEW ALBANY, IND., February 5th, 1897.

All members of the Western Gas Association who contemplate contributions to the "Wrinkle Department" should forward them, before March 20th, to its Editor, Mr. George Treadway Thompson, No. 40 Wall street, New York city.

It is hoped that many will avail themselves of the opportunity to assist in keeping this most interesting and instructing department up to its usual standard.

Members will please act promptly and forward "Wrinkles" without further solicitation. JAMES W. DUNBAR, Secretary.

[OFFICIAL NOTICE.]

Fourth Annual Meeting, Michigan Gas Association.

MICHIGAN GAS ASSOCIATION, OFFICE OF SECRETARY, SAGINAW, E. S., MICH., February 6th, 1897.

The fourth annual meeting of the Michigan Gas Association will be held at Ann Arbor, Mich., on Wednesday and Thursday, February 17th and 18th. The headquarters of the Association will be at the Cook House.

Papers will be presented by: Mr. L. M. Latta, of Goshen, Ind.; Mr. L. E. Walker, of Lansing, Mich.; Mr. F. W. Freese, of Albion, Mich.; Mr. A. D. Cressler, of Fort Wayne, Ind.; and Mr. Leigh Wickham, of St. Louis, Mo. HENRY H. HYDE, Secretary.

[OFFICIAL NOTICE.]

Twenty-seventh Annual Meeting, New England Association of Gas Engineers.

OFFICE OF THE SECRETARY, LYNN, MASS., Feb. 6, 1897.

The twenty-seventh annual meeting of the New England Association of Gas Engineers will be held at Young's Hotel, Boston, on Wednesday and Thursday, February 17th and 18th, 1897.

The meeting will be called to order at 10 o'clock A.M., Wednesday, February 17th.

The following papers will be read:

"Temperature," W. E. McKay, Boston, Mass.

"A Comparison of Gas Making in '53 with Gas Making in '96, with some of the Writer's Experiences," H. F. Coggeshall, Fitchburg, Mass.

"Separate Meters and Special Prices for Gas Stove Consumption," F. S. Richardson, North Adams, Mass.

"Measurement of Gas," C. W. Hinman, Boston, Mass.

"Gas Distribution," W. H. Snow, Holyoke, Mass.

"Some Remarks on Coke Ovens and their Products," S. J. Fowler, Springfield, Mass.

Several other papers will be presented, and a number of "Short Topics."

On Wednesday evening, at 7 o'clock, the members will dine together at the Hotel.

Members are urged to prepare questions for the Question Box, and to bring up subjects upon which they wish information or discussion in

the form of "Short Topics for Discussion." Such matter can be handed to the Secretary during the Meeting, or sent to him in advance.

Blank applications for membership can be had of the Secretary, and all matters requiring the attention of the Directors should be in the hands of the Secretary before February 16.

C. F. PRICHARD, Secretary.

BRIEFLY TOLD.

COAL TAR PRICES AND CONGRESS.—The arguments offered some time ago by the representatives of the gas industry before the Ways and Means Committee of Congress, over the instance of the equitable revision of the tariff list, in so far as ordering fair penalties on the import of coal tar and its products into this country is concerned, have had a benefiting influence, even though the arguments advanced by the chief spokesman—Mr. M. S. Greenough, of Cleveland, Ohio—received but slight recognition from the gentlemen who compose the Committee. Ways and means there are of showing discourtesy, and it is our unfortunate task to have to say that Mr. Greenough's presentation, fair and impartial that it was, was not treated, by at least one member of the Committee, with even common courtesy. However, the brusqueness of the treatment accorded the gas representatives, if it had no other result, had this effect—it proved conclusively that those who just now have control of the sounds which enter into the Committee's ear, over whether American or European gas tar should make the price of that material in the American market, are quite open to the pleadings of the American workers-up of the material, be the latter foreign or native. It is quite ridiculous to suppose anyone would be willing to give up a good thing, on the mere basis that, because when a good thing in America is regulated by what he has to pay for a foreign thing, an American worker-up of the good thing would submit to the imposition of a duty on the good thing which would take from him a bit of his profit, on the mere ground that the home producer of the good thing should have a chance to share more equably in the fruits that come with home production. So, it is that American producers of gas tar might better counsel with their individual representatives in the coming Congress, rather than trust to the assistance they might receive from any present standing committee of the current Congress. In a word, the regnant Committee seems inclined to favor free tar and the products thereof, wherefore it would appear the part of good policy that gas men should appeal, each to his own representative in the incoming Congress, for a chance to place foreign tars and pitch at least on an equal plane with the named same domestic articles. We were led to this idea by the reception of a communication from a correspondent, whose knowledge of the tar combination's ways is extensive and practical, which declares that up to a year or so ago the prices received by gas companies for tar were in the main satisfactory; but that within the past year, from the figures submitted by the tar combination, the latter evidently thought the rating of the market figure was completely in their control. This belief, however, our correspondent adds, is not as positive as it was some months ago, for the rejection by several of the gas companies of the combination's last bids is an assured fact, and such rejections point to the possibility that the tar producers are inclined to become tar workers, too. It seems, indeed, that the tar trust folks have been too wily; they would not let their good thing take fair way, and the cold fact is that their greed threatens to pitch them out of business. We have knowledge of the purpose of several large gas companies to engage in the business of tar working on their own account, when their present delivery contracts expire; one of which companies will work up at least 10,000 bbls. of the crude stuff each year. The beauty of the movement further is that this company will erect a plant that will be quite up to disposing of at least an additional 4,000 barrels, that, because of territorial conditions and transportation facilities, can be readily shipped from fairly nearby points and purchased at figures that will give the tar trust pain. The moral of the whole thing is that gas men must stick together, and tar is not a bad thing to begin with in that respect.

DEATH OF MR. A. M. BILLINGS.—Mr. A. M. Billings, one of the founders of the Peoples Gas Light and Coke Company, of Chicago, and for many years President of that corporation, died at his home in Chicago on the evening of the 7th inst. Deceased, who was born in Boylston, Vt., in 1814, settled in Chicago in 1859, and thereafter was prominently identified with the gas and banking interests of Chicago. At the time of his death he was President of the Home National Bank. Two sons survive him—Henry A. and C. K. G. Billings—the last named being the active executive in the direction of the Peoples Gas Light and Coke Company.

Address of the President, Thirteenth Annual Meeting of the Ohio Gas Light Association.

[Delivered by MR. JEROME PENN, President Washington C. H. (Ohio) Gas and Electric Company.]

Gentlemen: Once again the hand on the dial of time points to the hour for assembling the Ohio Gas Light Association; and, for the thirteenth time, we meet to counsel together and legislate for our best interest.

It is to be hoped, and very much desired, that all personal interests, curiosity and outside attractions will, for the time we are assembled, be laid aside and left to care for themselves, and that only the feeling of enthusiasm, which is essential to all enterprises, shall actuate all those who are here laboring for the advancement of our Association.

Contrary to our established custom, we meet this year in this great metropolis of North America, in response to an invitation tendered by The Gas Industries Company.

Ohio, the mother of State Gas Associations, is happy to hold its annual meeting at this time in America's chief city, "The Greater New York," and we recognize with gratitude the kindness of Mr. E. C. Brown and associates, through whom we are recipients of the invitation.

We all realize to the fullest extent the vicissitudes of the year just gone by. It has been one of general business depression, characterized mainly by shrinkage in commercial values, curtailed production, decrease in value of residuals, enforced economy, low prices, and organization and advancement of many questionable schemes, which, unless soon checked by wise and skillful legislation, will lead to results irreparably detrimental to the best interests of those who, thoughtlessly perhaps, tolerate such grievous practices.

But so surely as sunlight dispels darkness, and the mantle of shadow is lifted by the approach of dawn, just so surely will this period of national unrest and depression be replaced with restored confidence, returned and renewed prosperity.

The fact that other countries have suffered in the same degree from similar conditions brings with its knowledge little or no consolation; however, it certainly shows that our calamities are not to be traced to exceptional causes. This in substance has been voiced by former Presidents, but it is strikingly and disastrously true at the present time.

As one of the remedies to arouse us from this lethargy, and to overcome the circumstances that have and in a great measure still exist, let us not lose sight of the important fact that our permanent prosperity as an organization depends entirely upon the exertions of each individual member endeavoring to make it a success.

Let our thoughts and actions be always of the progressive kind, not being unmindful, of course, of the trusts imposed in us by those who are the investors; so, let us for the future, one and all, make up our minds to contribute our share to the success of our worthy Association. In short, let us all come out of our closely closed shells, inform ourselves thoroughly upon the demands of the times in which we live, and each vie with the other towards proficiency in the work we respectively represent.

To our Advisory Committee I wish to say: We fully appreciate the success you have accomplished while performing the various affairs of the State intrusted to your attention and judgment. We sincerely thank you, and feel that the gas industries of the State owe you a debt of gratitude for the excellent manipulation of matters pertaining to our good, and for duties wisely and faithfully performed.

I wish to emphasize the benefit of membership in our Association to the entire gas fraternity of the State of Ohio.

From the very first meeting I ever attended, I carried home with me valuable information, which, put into practice, realized us good results financially. I consider that I have obtained value received many times over for every dollar expended in attending our meetings, where those older in experience are always courteous, and gladly respond to all inquiries.

Cannot some measures be employed by which every man interested in either the manufacture or the sale of gas, from the presidents of gas light companies, down through the various offices to that of the most humble employees, may be made to realize the importance of this, so that they may, to the greatest possible extent, become members of our Association?

The purpose of this organization is not to make a display of our intellectuality; but, on the contrary, to provide a place where one and all can meet on common ground in the same circle, and feel no hesitancy in propounding questions or expressing views—understanding

that in this home for exchanging ideas, every man is a member with equal privileges, entitled to, and sure to receive, respectful recognition in all respects.

Surely, in such a gathering as we represent, there are abundant resources from which may be culled enough information to repay anyone for the time and expense consumed in attendance upon our meetings, no matter what questions may be discussed; if the subjects presented happen to be in our own direct line of interest, then are we doubly benefited, and each man returns to his work with increased knowledge; and no man knows less.

Our relationship is becoming more intimate with each successive year, and the more we have of each other's influence and assistance the more efficient work we are able to accomplish for our various companies.

Then, too, we can induce the new man to give his theory and tell us what he has heard and learned, and, after having imparted this information to others, the criticisms and suggestions of his hearers and the press, will cause him to be only the more acute, that his observations may be the more accurate. Thus there is no more effectual way or means of being informed than by imparting information.

I believe one of the greatest hindrances with which we have to contend in bringing to these annual gatherings our harvest of the year, is that we have not been painstaking enough to educate ourselves while making our gleanings. The time has arrived when we must awake to a realization of the position we occupy in this field of labor. We can no longer jog along in the old rut. We must be progressive, grasping the new inventions and ideas as they present themselves, and carefully prove them to see whether they will result in good or evil. In other words, let us educate ourselves according to the position we fill, improve every opportunity, and unitedly we can realize that there is a power behind the Ohio Gas Light Association. I recommend that this body instruct the Executive Committee to select some one of renown and experience to address us at our annual meetings. But, you may say, our funds are not sufficient for this extra expense. We cannot afford to have our minds depleted by not keeping in touch with the higher aims and greater possibilities of the gas producer. Let us devise means for filling up the treasury and accomplish this purpose, for we cannot afford to retrograde after having fought our way this far. It will forever tell against us.

The gas business is as honorable as any of its sister industries, and has now passed from its historical period of luxury to the practical one of necessity. If we are rated below our true estimate, a little self-assertion will be for our good; we cannot afford to be submissively humble to the exclusion of all other virtues; we cannot and must not stand still, for if we are silent we will soon be listed among the forgotten, and will decline in usefulness accordingly. Having by persistent effort, and sometimes bitter conquests, gained the place we now occupy among the commercial industries of this age, we must not cease putting forth every effort to effect continued growth, for if we cease to grow we become smaller and die.

I would rejoice much this morning could I close these remarks without reference to the removal by death of any of our membership. As an Association, we mourn the loss of J. R. Thomas, of New York, whom God in his Providence has called from labor to repose. As a fraternity, let us pause a moment and be reminded that death seeks a shining mark, and we must bow submissively to its mandates.

Mr. Thomas was a competent and wise counselor, one ever ready and willing to assist with his advice, and one whom we respected and admired for his many sterling qualities and manly virtues.

Finally, gentlemen, the meeting is in your hands—yours to do with as you will. However, I am sure of your course, knowing that you are all anxious for the success of the convention.

The individual members can contribute to and realize this success, first, by attending promptly at the appointed hours for the assembling together; and, again, by participating in and earnestly joining the discussion of the various papers presented. Let there be no lagging, let each one be ready to add his mite of information, or inquiry for knowledge, as the case may be, with promptness and vigor, and thus enthusiasm will carry this session successfully to its close.

Through the untiring efforts of our capable and efficient Secretary, we have papers upon matters of vital importance to the gas fraternity, and by authors who are practical men among us; hence, as we all agree that those of our members who have taken the trouble and time to prepare papers for this meeting are deservedly entitled to our sincere thanks, in no way can we better show our appreciation of their efforts than by coming punctually at the hours announced in the programme, that they may have the inspiration of our presence to aid them in delivering their respective addresses. This is theirs by right of courtesy, and I feel sure each member will concur in this and fulfil his individual responsibility and duty.

In conclusion, allow me to express to you my acknowledgments for the distinguished honor conferred upon me in your selection of me to preside over your deliberations at this meeting, begging indulgence for any shortcomings, reminding you that I have not had the experience of my worthy predecessors in filling positions of this nature.

I hope throughout this meeting to show my appreciation of the honor and privilege bestowed upon me. I now announce that the 13th annual meeting of the Association is open for business.

Gas Stoves: Their Introduction, Construction and Use.

[A paper read by Mr. T. C. Jones, Supt. of the Delaware (Ohio) Gas Company, before the Thirteenth Annual Meeting of the Ohio Gas Light Association.]

Subjects of interest are constantly presenting themselves to the mind of the gas manager. Some of these are often worked out in a practical manner, resulting in material good for the Company represented; others, though fair to look upon, do not fulfil their promise of profit, are abandoned as worthless, and can be charged to experience—that valuable, though oftentimes costly teacher.

There is one problem, however, which in the management of a gas plant cannot safely be neglected, and this is how to increase the consumption of gas; and in order to its solution one of the most important subjects is that of gas stoves. The percentage of income derived from this source is now very large with most companies, and I believe the time is not far distant when we will draw the greater part of our revenue from this source. For the achievement of this success, however, the gas fraternity will be held largely responsible. We must adapt ourselves to the local conditions which surround us; keep a large line of the best appliances on hand, and put them on exhibition in a manner as attractive as possible; take advantage of the novel schemes which have been tried by others, viz.: cooking schools; soliciting agents making a house to house canvass; using prepayment meters by setting them with the apparatus; giving stoves away; renting stoves; making exhibitions with baking powder companies, flour men, etc.; writing personal letters to the ladies of households; having dealers sell stoves at cost—the gas company paying them the profit; placing stoves in church kitchens free of cost; distributing calendars, memo-books, etc., with our advertisements on them; giving away stoves, but requiring the consumer to pay for a stated amount of gas in advance, and by using the newspapers liberally for advertising. I might continue relating plans familiar to you, any one of which I believe is worth your consideration.

It has been my good fortune to be connected with a small, though aggressive Company, always willing to make advance where success seemed at all probable.

In the spring of '96, we decided that something should be done to increase the sale of gas stoves, notwithstanding the fact that we already had several hundred in use, as well as a number of heating stoves. It was thought that if, in some novel and attractive manner, attention could be drawn to the great desirability of gas stoves, the sale of the same might be greatly augmented. After deliberating over the matter, we concluded to give a gas stove exhibit in the shape of an "Afternoon Tea," a function most dear to the average feminine heart. To this end a guest list was made out (from the consumers' register and from the city directory) of those who might be induced to take an interest in gas as fuel, and the invitations were delivered by the meter readers. Notices were also inserted in the daily papers, giving a general invitation to the event. These notices ran something like this: "Don't forget the Gas Stove Exhibition on Thursday and Friday afternoons." "Biscuit baked while you wait." "Free street car ride to all who honor the Gas Company with their presence on Thursday and Friday afternoons." "The greatest novelty in Delaware—the Gas Stove Exhibition—don't miss it, etc., etc."

According to advertisement, free transportation was given on all the street car lines to those who accepted our invitation.

The office building was beautifully decorated and made ready for the occasion. On entering, the guests were received in the Superintendent's office by a Committee on Reception, composed of the Directors and their wives, and then were ushered into an adjoining room where a number of gas stoves of different makes and sizes were shown. In this room, behind a screen of palms, was stationed an orchestra, which added much to the social enjoyment of the affair. Ascending

the stairs, the guests were given a practical illustration of the working of gas stoves, a number of them being in operation, and a competent cook busily engaged in preparring dainty refreshments of hot biscuit, coffee and chocolate. The Directors' room, by the aid of rugs, pictures, and handsome furniture, had been transformed into a quite presentable dining room. Here were small tables covered with snowy linen, with silver and china service, each having in the center a vase filled with roses and carnations. At these tables the guests were served by well-trained attendants, with the refreshments which they had just seen prepared on the ever ready, never failing gas stove.

In another room was given a display of gas fixtures which elicited much admiration, and from which many sales were made—the Company being fortunate in having in stock a number of new and beautiful designs.

Did it pay? We think it did. During the two afternoons of the Reception, nearly 1,000 persons honored us with their presence, and were seemingly well pleased with our manner of receiving and entertaining them. Thus, a more friendly relation was established between our consumers and ourselves, and the community at large had a better opinion of us than ever before.

As perhaps you may have heard in your career as gas men, a gas company is commonly considered as a soulless, greedy corporation, going about "reaping where it has not sown and seeking whom it may devour," whose bills are ever too large, whose conscience is ever too small, and whose business is all profit and no expense.

To be the recipients from this "grasping" corporation of a free ride, free concert and a free lunch, together with polite and kind attention, was indeed a great and happy surprise to many hitherto misguided persons, and proved to them that we were but men even as themselves, and desired but our just dues and a fair return for capital, time and labor invested.

We have tried several other schemes for the introduction of gas stoves. One of the strongest levers we have used is that of sending personal letters. We take a household we know should be equipped with a gas range, and if gasoline be in use, we boldly attack it, showing the danger and all the disagreeable features of this highly explosive and odor laden oil. If it be a coal stove we treat in like manner, and in all cases endeavor to show the superiority of our fuel, and make the letter bear its own peculiar mission. I have been surprised at the prompt replies we have received from such letters—almost invariably getting an order for a stove.

Several years ago we established the plan of renting stoves. For a 4-burner range, the price of which being about $18.00, we received a rental of $3 per year, and a 3-burner, costing $15, we put out on hire at $2.50 per annum. It was not long until we had something over 100 ranges placed on this plan, the revenue from which was about $300 per year.

Experience has taught us that the average life of these stoves has not been longer than four years, so that on the whole our stove rental account has shown a loss. Consumers do not treat our stoves with the same consideration they would bestow on stoves of their own, and are continually wanting repairs for them; complaining that the burners do not work as they should; that the stove becomes dirty; that the oven does not heat well, and other similar grievances, maintaining the only remedy to be a new stove. I have been informed that the same annoyance and trouble arise when stoves are given away or loaned without charge. Most people when they get something for nothing, put no value upon the goods they have purchased on such terms, and very often, after they have had a few stiff gas bills, come to the conclusion that they have been led into a trap, and, as usual, the gas company has the long end of the bargain.

We are still putting out stoves on hire, but on account of the many objectionable features connected with the plan, we have for some time past been endeavoring to sell them at cost, making connections free, and payments easy, where necessity requires. This plan has proven quite successful.

Instead of renting stoves, it is far better to induce consumers to purchase, and purchase the very best stove possible. I believe it will then be treated with esteem, the gas used in it with consideration, the consumer will be satisfied and continue to use the fuel which we all know to be par excellence.

Our greatest source of annoyance has been the short lives of the stoves, and we are beginning to realize that it is false economy to invest our money in gas ranges, which only last a few seasons and then become worthless.

Those who have purchased ranges which play out in a short time become disgusted with them, though they should have had good results with gas as fuel. They look with contempt upon the range, and treat the inquiries of others on the subject either in an indifferent or, what is far worse, a derogatory manner, often losing us the sale of a stove, whereas, if an effective and durable appliance had been installed we would continually have an enthusiastic advertising medium, more valuable than money can purchase.

The great majority of gas ranges in this country have been constructed of light sheet iron, and will rust out in a short time. In England they have been manufacturing stoves for several years which I think have been far in advance of ours in point of construction and durability. Most of the large manufacturers give a guarantee with every stove by which they undertake to replace, free of charge, any parts worn out within ten years, except of course, the movable parts, which are liable to rougher usage than the fixed stove.

For some time past I have had in my own kitchen a stove made on English principles. The entire body is cast iron, lined with steel plates coated with enamel, which will never rust. By this construction the stove can be easily kept clean, and is practically indestructible. It has but one oven with a row of jets on either side; on the top are three cooking burners and a broiling burner, all of which are very efficient and deserve more than passing notice.

The saving in gas consumed over an ordinary stove is about thirty per cent.; the cause I attribute mainly to direct radiation in the oven and the general completeness of the stove. Meats roasted in this oven on a spit retain their delicious favor, are evenly cooked, tender and crisp, so that when they are served on the table they create an appetite which can only be satisfied by the relish of food cooked in this manner. By those who enjoy home-made bread, pastry, etc., where perfection in baking is essential, the superiority of this oven will be appreciated.

I do not believe in the theory that the products of combustion coming in contact with the food are injurious when the oven is well ventilated. In my own house, where I have used only gas as fuel for the past 4 years, and where a great many ranges have been tested in a practical way, my conclusion is that this range excels in many points the stoves in general use. In my opinion the vital part of this branch of our business is the establishment of the use of high-grade appliances. We should be just as anxious to have the gas stoves about our community working satisfactorily as our retorts. This is an age of cheapness; to build cheaply, at the expense of durability, is the aim of many manufacturers. This is so in many branches of industry. It is so in ours. And with us the blame of a poor, cheap gas stove will fall not on him who builds it, but upon the long-suffering, over anxious gas manager who has placed it in some kitchen, guaranteeing it to give good and faithful service, which, from the nature of its trifling construction, it cannot do. And besides, it creates enemies of our business—as a whole. Therefore, for our own protection we must insist that the manufacturers, instead of aiming to make their stoves for a less price, should build them more serviceable, more durable, and better in every way. In our business as in others which involves close and constant relations of the producer and consumer, there is the method of quick sales through low prices and cheap articles, which draws after it the later condition of dissatisfaction on the part of the purchaser and annoyance for the seller.

There is another method which seems to promise less quick returns and more difficulties, but which in the end is the more profitable—a larger outlay at the start by the purchaser, and consequent larger satisfaction on his part and far better returns for the producer.

Gas consumption must be made to be as satisfactory as possible to the consumer. The increased labor and difficulty which appear so formidable to many a gas man when he contemplates the introduction of more costly apparatus in the homes of consumers are less in fact than in appearance. The thing can be done. It has been done. More labor and effort are indeed necessary, and especially more care, forethought and painstaking attention. But the result justifies the means. An idle spring, however delightful its inactivity, will not be followed by a bountiful sumner and autumn, while the labors of the seed time will make glad the laborer's soul when the harvest days dawn upon golden returns.

And now let me say in conclusion, here is the reason why the sale of stoves should be kept in the hands of the company. Stoves of the right kind are essential; stoves of the wrong kind are the forerunners of trouble and loss. For self-protection this is a detail of the mode of gas consumption which we must endeavor to control. Even on a large scale this I believe to be possible, especially if the simple plan of sale of stoves at cost or less than cost be followed. There is a future for gas stoves—for gas consumption—through their use, and for the ascending importance of the work in which we are engaged in the

homes and hearts of the people. We must have the best or nothing. Following this manner of procedure, we will in due time receive our just compensation and be regarded for what we are in reality to-day—a time, labor and money-saving institution, a benefactor to woman everywhere and a "light to all mankind."

State Regulation of Corporations.

[A paper read by MR. G. H. CHRISTIAN, Supt. of the Norwalk (Ohio) Gas Company, before the Thirteenth Annual Meeting of the Ohio Gas Light Association.]

In writing on this subject, I will present to you some of the evils resulting from the present laws, and suggest lines of change which appear full of promise for the future.

It would seem as though the long and dearly bought experiences of our gas managers would have taught some of us useful lessons on this subject, and these when ventilated would become invaluable directors of thought and moulders of action, thus prompting the well defined duty of each of us to add our quota to the sum of all experiences, that we may be directed aright in future legislation.

There are varying degrees of power conferred by the States upon corporations; to some are granted merely the power of barter and sale, others that of eminent domain, to transact a business closely allied to the public service; these latter are called public service corporations or common carriers, included in which class are railway companies, water companies, pipe line companies, gas and electric companies. The right of State regulation is in direct proportion to the powers conferred, small powers carrying few regulations, large degree of sovereignty, strict and rigid control. We cannot question the right or justness of this supervision; we may, however, consider the best means the State can employ to carry out its aims.

Past legislation on gas matters in our State has been wholly in a line to protect the people from corporate greed, and but few laws have been passed to secure a corporation in its property against the greed of the people. The States have almost universally delegated their authority to the municipalities where the corporate property is situated. Our larger cities, as a rule, are governed by a body of men selected for their political sagacity—their ability to wield the party power; business ability, knowledge of the needs of the community, capacity for governing, honesty and integrity, being secondary considerations in a candidate for election to the above offices; into the hands of such a body corporate all State regulation of local corporate interests is placed. What should we expect? What do we see? The very laws that have been passed to secure the people against the evils of corporate power have been used to stimulate and perpetuate those evils. The dominant idea of regulation by competition has produced unexpected results. Glance over the history of the gas industry in our large cities—New York, Brooklyn, Baltimore, Chicago, St. Louis and others; franchises have been granted to competing companies for the ostensible purpose of reducing the price of gas, the inevitable and universal result of which has been combination, increased capitalization to pay for duplication of plant, increase instead of decrease in price of gas.

Our business relation to the public subjects us to strict regulation, but all the more necessary is it that this control should be placed in responsible hands. Men of high moral standing and integrity, experts in their line, eminently fitted by business experience to comprehend and decide wisely the problems laid before them, should be our censors. Under our present laws the warfare between the company and city begins with the act of incorporation; then must the gauntlet be run and authority to open the streets be obtained. At all times and in all manners the books and papers of the corporations are subject to public examination; all errors of management discovered, fully ventilated, with scarcely an effort made to reach an amicable adjustment of the points in dispute, the power of the courts must be invoked; the directors and manager subjected to rigid cross-examination and treated as common criminals endeavoring to hide their plunders. By such method of regulation do you expect to bring our corporate interests and the people into a closer bond of friendship? To create the spirit of charity and faith? Settlements of disputes obtained in this way savor of persecution, create enmity and distrust, and must finally terminate injuriously both to the people and the corporations themselves.

We have seen under the present method of control the parent gas companies of our cities subjected to a threefold system of attack. Any patent company desiring to force a sale of its patents has but to obtain a franchise from the City Council, under pretext of ability to manufacture gas cheaply, and with a said franchise in hand exact the last farthing. Failing in a sale, they are free to build a plant, duplicate mains and services, and enter into competition with the old company, forcing a temporary reduction in the price of gas till a combination of interests is arranged or the territory divided when the price is restored to the original or even higher figure. This was the method employed throughout this country by the early promoters of the Lowe water Gas Process with which many of you are quite familiar.

Another method showing the abuse of the present laws. A combination of capitalists seek an investment—various corporate properties are examined—some one meets their approval; to gain the controlling interest in that property at a discount, they move before the City Council for a franchise which at once reduces the market value of the property, and thus under cover of a law passed for the purpose of protecting the people, they gain their nefarious ends.

Another method much in vogue and but recently prosecuted to its fullest extent in our State—an agitation is started for cheaper gas; the papers discuss it, the City Council is importuned to act, an investigation is authorized, the whole machinery of the courts invoked; the papers, books, records, officers and managers of the company examined; expert testimony introduced, and the company finally forced through fear of greater loss to accept terms, with the result that the price thus established is one highly satisfactory to the people, but totally unremunerative to the company and injuriously affecting all similar corporate interests throughout the State.

There is a point beyond which force or competition cannot go and bring reward to the people. When our large corporations are compelled to dispose of their manufactured products at a figure that will not permit of their laying aside yearly a surplus for extensions of plant, etc., they are being unjustly dealt with, and the people ultimately injured from the inability of the company to give good service in the future. Do not deceive yourselves in the belief that all future extensions can be taken care of by an addition of capital, and the new business earn interest charges.

Our extensions must be made into territory undeveloped and unimproved, and capital thus invested is idle capital to be taken care of out of the old business.

I note from the papers that the city of New York is considering the question of an investigation of its gas companies. Whatever may result, injury will be done; should the people win, they will rejoice at your discomfiture, and the politicians be given another long pull at the helm; your success would be a club in the hands of the people, to be used at some future day against all corporate interests. Public investigations of private business can only result in distrust and emnity. Far better for the companies themselves to seek arbitration of their differences.

Law is the instrument of justice; the main factor in the hands of the body politic for the mitigation of evil; the chain that binds together the heterogeneous and diverse natures and interests of society in one harmonious whole; the forms of law represent the sentiment of the people, as expressing their *summum bonum* of government; abuse of the laws carries with it the germs of social disintegration and decay and should be combated by all lovers of good government. As the enforcement of the laws depends upon the will of the people, public sentiment must be maintained at its highest point of moral rectitude, to perpetuate a government of the people and by the people. To sit quietly by and calmly view the ever increasing misapplication of our laws, by those whom we elect to execute them or by the corporations whom we delegate to carry on our vast business interests, that enter into and become a major part of our social system, is the height of folly and threatening to the stability of a people's government. Much of the present legislation that has proven so obnoxious and detrimental to our corporate interests is due to the latter's total disregard of the rights and interests of others. We must either be prepared to meet the people on a plane of equal justice and fair dealing without the compulsion of law, or acquiesce in those laws they may deem necessary for their protection, and thus continue to aid the extending of a public sentiment that promises finally to become more than merely obnoxious to all corporate investments.

The problem of State regulation of corporations is rendered difficult of solution on account of the opposing interests to be harmonized; under a system of minimum legislation the corporations become the oppressors; a system of rigid control reverses this, and the corporations are made to feel the iron heel of the law.

The most universal method adopted by the States to regulate corporate business has been the trade one of competition; this, you have seen, has not only been unsatisfactory but highly conducive to evil,

and has been condemned by a large number of able writers and thinkers in this country and abroad, and must eventually be prevented instead of encouraged by law.

All State regulation by direct legislative enactments, such as the establishing of a sales price for corporate products in cities of the same class throughout the State, would work hardships on many companies, as all are not similarly situated to manufacture and sell at a fixed price. The benefits received by one community would be overshadowed by injuries done to another. Such methods are too drastic, too inelastic, and do not recognize the right of each company to present its business conditions and management in a true light and have the same adjudicated by competent, disinterested arbitrators or duly appointed commissioners.

The history of municipal regulation is too replete with evil to need further comment here, other than to say that the horizon of corporate business would indeed be dark were it not for the prospect of an early dawn of better laws, when all regulations of our corporate interests will be eliminated from politics.

The problem of State regulation resolves itself into this—how to establish an equilibrium of equity between the people and the corporations by a system of laws that will assure to both their due share of justice and protection, while not permitting to either the power to oppress through the abuse of the laws.

Taking the following as a business maxim, that all corporate property or business is a benefit to a community in proportion to its ability to earn a fair margin of profit at the least cost to the consumer, there follows that the first duty of law should be to carefully guard the people from excessive capitalization of corporate interests; that all corporate property must be protected from depreciation or destruction by public or private competition; that all corporations should be compelled to use diligence in adopting improvements in manufacture that show marked economy.

The law should establish the maximum per cent. of profit allowable. It should require all corporations to lay aside yearly a percentage of its profits as a surplus fund for improvements and extensions, thus removing the necessity for increasing capitalization.

All enforced public examinations of corporate business should be prohibited. A tribunal of private arbitration should be established to determine disputes, with the full powers of a court of equity.

Sworn detailed accounts of corporate business should be filed yearly with the commissioners or arbitrators. The municipalities should have no power of control over their corporations, other than those necessary for the protection of their streets and property.

The life of a corporation should not be limited.

The directors and officers of every corporation should be held strictly amenable to all the laws, and due regard for the minority interests should be taken.

These are some of the lines in which our future legislation on this subject should be directed.

Some twelve years ago the State of Massachusetts revised her laws on State regulation of lighting companies, whereby a large share of the power of control was placed in the hands of a commission; many of the evil features of her former laws were eliminated and advance ground taken. The most beneficial change was the pledging of the faith of the State to those who had risked their capital in public service corporations, to protect them from destructive competition, either public or private, so long as they served the public well and cheaply; and quite lately Governor Wolcott, of Massachusetts, paid this clause of the law a high tribute. I quote his words: "The State of Massachusetts owes much of her prosperity to the safeguards she has imposed upon her corporate investments under which the rights of the public and the rights of capital are both insured."

Another marked advance in the Massachusetts law was the method adopted to determine disputes between the companies and the people, by which all matters at issue are presented to the Board of Commissioners at a private hearing; decisions rendered are returned to the companies and the latter ordered to enforce the same. No publications or public examinations are permitted to stir up the public pulse and create animosities; everything in its nature judicial, yet carried out under the rules of State arbitration.

Ours is but one of many private corporate interests that have been vitally affected by the lax condition of our laws; our mutual interest in the future welfare of our business and security of our property investments should act as a basis of union and incite us to unite upon some plan of action favorable to ourselves, at the same time guaranteeing to the people an equal degree of justice and protection.

In concluding this paper it is my pleasure to suggest that this Association take the initiative and appoint a committee to investigate and report at some future time.

The Large Gas Engine: Its Present Development and Forecast of Its Future for Electrical Purposes.

[A paper read by MR. E. F. LLOYD, Secretary of the Western Gas Construction Company, Fort Wayne, Ind., before the Thirteenth Annual Meeting of the Ohio Gas Light Association.]

The present development in gas engine design is divided sharply into two general classes, single acting and double-acting. The former is much older and still much more in use; the latter is a comparatively recent development, and has aimed more to occupy the field of higher powers than has its single-acting competitor.

Of the single-acting engine there have been a number of types, of which it is sufficient to say that the only one which has survived to attain a widespread reputation is the "Otto." I refer in this connection to the "*cycle*" upon which the engine operates, and which is completed in four strokes, or two revolutions.

In double-acting engines the original practicable type was known as the Griffin, or 6 stroke cycle, which introduced an idle revolution for the purpose of cleansing the cylinder from the products of combustion which remain in the compression chamber of the Otto cycle. This scavenging revolution, however, was abandoned, and the Otto cycle substituted; but the double action, in general design the same as the ordinary horizontal steam engine, was retained, and this feature constitutes the essential difference between the two types.

It is only within the last three years that the double-acting type has been seen in America, and consequently is familiar to but few. Originating in England, with the engineering firm of Dick, Kerr & Company, it has been in successful use for about 10 years.

The essential differences existing in their operation are directly consequent upon the difference in design, and as the single-acting is much older it will be proper to consider that first. In all well known single-acting engines, as now built, the piston is its own crosshead; that is, the connecting rod is pivoted directly into it, and there is no piston rod. While this permits a short, compact machine, it necessitates a heavier construction of piston, and, what is much more serious, it forces the wear of the "angle thrust" of the connecting rod on to the bottom of the cylinder. This may be made clearer by saying that the pressure of the explosion is applied at the back of the piston, and in the consequent forward movement the front end of the connecting rod rises with the swing of the crankshaft—owing to the wristpin joint being in the piston, it causes, so to speak, a "buckling" tendency which presses downward upon the cylinder bottom. In small engines, when well lubricated, this is not a serious matter, because the heats are not so great as to impair the lubrication, and the weights and pressures do not exceed the cylinder's *wear-resisting* qualities; but in large engines the conditions are different, the power of the impulse and angle thrust, and the necessary weight in the piston and connecting rod, increasing very much more rapidly in proportion than the wearing surface on the bottom of the cylinder, together with which is the increasing difficulty of proper lubrication in the greater volume of heat. All these causes working together seem to fix the practical limit of the single-acting engine at about 16 inches diameter of cylinder, corresponding to about 75 indicated horse power. Larger engines of this type have been built abroad, but they have not, so far as we know, become a commercial factor.

The regulation of single-acting engines for electrical work presents much difficulty. The maximum of explosions being one in four strokes, on anything less than full load frequently 8 or even 12 strokes intervene between explosions. This irregularity has to some extent been overcome by the use of heavy fly-wheels and high speed in the engine, supplemented generally with a countershaft carrying a solid or a spring balance wheel and the belting done from that to the dynamo. In this manner, through the inertia of the wheels and the elasticity of the belts, a fair degree of steadiness has been obtained, but necessarily at an expense of power and floor space. The difficulties in the way of effecting their sensitive regulation are twofold: First, the long interval between impulses; second, the inherent irregularities in mechanical governors themselves, due to inertia, friction, uneven lubrication, wear and actual work frequently to be performed.

In turning to the double-acting engine of ordinary construction we find many of the difficulties to contend with met in the single-acting; except, that they are greatly modified in their effect, the practical result of which is to permit the engine being built to very much greater powers, the exact limit of which we do not know, but can safely state it at not less than 500 I. H. P. in a single cylinder. This increase is simply illustrated by saying that if a 16 inch cylinder will develop about 75 H. P. in a single-acting engine, if the same pressure is applied to the return stroke, making it double-acting, it will give 150

H. P., and this is approximately true. But there are other conditions which greatly increase the power possibilities of this type.

In the first place, the piston for the same diameter of cylinder is much lighter, having nothing to carry, and, being strongly bound together on a piston rod, one-half of the weight of which, and all the angle thrust of the connecting rod, being carried by the crosshead in the frame where wear and lubrication present no difficulties. The heats upon the piston and cylinder are uniform, and a special construction of the piston can be used, which provides for a considerable amount of expansion in it, with the result that these engines have so far been built as large as 25 inches diameter of high pressure cylinder, and in this size have produced 280 H. P. on producer gas, corresponding to 325 H. P. on coal gas. The particular engine referred to was completed in October, 1894, and has since been in operation, driving a weaving mill, in Lancashire, England.

I must condense mention of the other prominent advantages of double-action by saying that it is possible with it to obtain two impulses instead of one; that these impulses are of half force, comparatively, to the total power, and consequently produce less shock to be absorbed by the fly-wheels, hence a lighter flywheel and lighter working parts throughout are possible; the wear on all journals and bearings is equalized, while the wear of the piston on the bottom of the cylinder is no more than in steam engines of equal diameter. It will not be necessary to take up your time with further detail upon the advantages of such construction, and we, therefore, come directly to our immediate purpose, the relation of these gas engines in large powers to present electrical requirements.

In 1892 it was learned that a double-action engine was being successfully built in England in large powers. Investigation of the matter finally resulted in the Company with which I am associated becoming connected with its introduction in America, using the patents and drawings of the English builders. The engine was then, and is now, for ordinary mechanical purposes, fitted with the usual "hit-and-miss" mechanical governor, which is probably neither better nor worse than other governors of its type. With it the engine secures only the advantages heretofore enumerated of double-action, and, compared with high grade steam engines, cannot be regarded as particularly well adapted for the special requirements of direct driven electrical work, although entirely suitable for all ordinary mechanical purposes. Shortly after it was introduced it became apparent that, in its original form with its mechanical governor, it was not suitable for incandescent electric lighting, in that it only reduced the difficulties inherent to the single-acting engine.

This question of governors does not seem to have had the consideration due it. Perhaps it would be more correct to say that its paramount importance has not been appreciated. Until recently the gas engine in large units had not been deemed a serious commercial quantity. Latterly it has forced its way to recognition, but still no such general study has been accorded the philosophy of it, as to the steam engine or the electric motor. While the improvements in detail and construction have been great, no radical advancement has been made upon the principal and type of 20 years ago; and, perhaps, the governors have kept pace in that respect.

The gas engine governor deals with a kick or blow which must be anticipated by three strokes to be prevented or permitted. Therefore, it should be sensitive to the slightest variation in speed; should magnify and indicate such variation instantly; hence, must be too light to exert any power whatever, and must operate in conjunction with an actuating power capable of responding instantaneously to its indication. These remarks apply with greatest force to the "hit-and-miss" principle of admitting charges, and which is practically the one in universal use. The "variable charge" type is mentioned later.

Realizing this, an exhaustive series of experiments were undertaken in regulation for electric work, using the "hit and-miss" and "non-variable charge" principle. These experiments may be divided into three classes. First, permitting the engine to run as it would with its mechanical governor, and automatically introducing resistance into the dynamo circuit to prevent the voltage rising above normal. Second, maintaining the voltage of the circuit by a varying speed of the engine according to the load. And, third, maintaining a constant speed upon the engine by its own governor, and applicable to any class of work. The final result only was practical, and should perhaps have been the first attempted, but it is due to the others to say that they indicated the means by which the last was accomplished, and this certainly promises all that could be desired on the "hit-and-miss" principle.

In the matter of regulation, it has been determined, by tachometer readings, that this governor controls the 130 indicated horse power engine, installed at Lancaster, Ohio, in July last, within 3 per cent. total speed variation from no load to full load. That is, 1½ per cent. above or below the normal of 180 R.P.M., and positively prevents any semblance of racing. It must not be inferred from this statement that the engine actually varies 5½ revolutions in speed in different minutes. A speed indicator will count the normal number of turns, minute after minute, with scarcely a variation, and it is only by tachometer readings that the variations in the rate of turning can be observed.

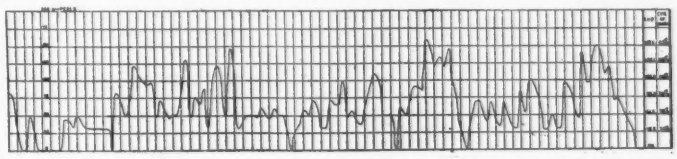


Fig. 1.—Load Card, Lancaster, Ohio; 150 readings; time, 30 minutes. July 7, 1896.

Reference to the load card above, made from ammeter readings at 12 second intervals, constituting one-half hour's operation, will give an idea of the extreme and rapid fluctuations. The vertical lines are 24 second intervals, the horizontal are each 25 amperes, and show as high as about 150 horse power; but this momentary load is, of course, maintained by the flywheels. The extreme voltage variation was from 490 to 510 volts during the reading, the low point only being touched upon an overload of the engine beyond its capacity. The road operates ordinarily six cars (when the reading was taken four cars were in service), and has one long grade, the rest comparatively level.

The instaneous response of this engine through its governor, from no load to above its maximum capacity, should have attention in comparison with the more gradual recovery of a steam engine. I think this regulation will compare favorably with that of the best steam driven service, and is due to the *instant control* by the governor of all, or none, or any intermediate power of the engine to maintain the set speed.

This engine has been in daily operation 18 hours per day, with very few shut-downs, and none that were not directly due to small adjustments in mechanical details or to inexperience on the part of the operators, to whom the requirements of this class of work were entirely new, and having been carrying this load under these conditions for seven months, it would seem reasonable to have confidence in it.

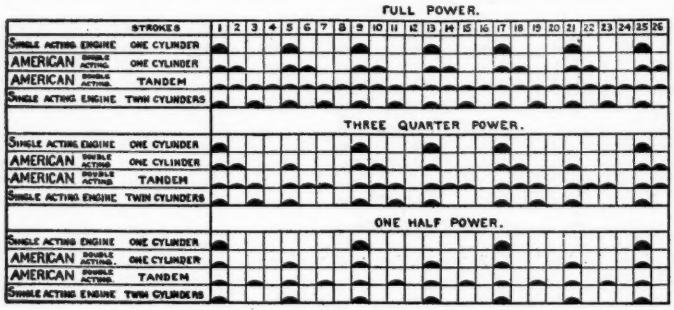
Another engine of the same size and type has recently been installed at Marietta, Ohio, which is to also drive a street railway plant in connection with a similar engine of about 90 horse power, these two being a preliminary equipment.

The variable charge governor, previously mentioned, is on a radically different principle. Mr. John Hartley, of the English firm, some years since devised a governor of this type which they styled an "electric lighting governor." This is a most ingenious mechanism for proportioning the amount of charge to the work in hand, but maintaining the due proportion of mixture of gas and air required for the most effective explosion, and admitting anything less than a full charge towards the latter part of the stroke. Finally, it provided that from one-third to full load the engine would receive an impulse at every cycle with no cut-outs. I will not attempt to describe how this is accomplished, but within its range it is very effective. A 210 horse-power tandem engine of this type is at present in this country, and has done some beautiful work. It is, perhaps, the highest expression of the theory of economical use and effective governing by a strictly mechanical means of which the Otto cycle is capable. Improvements have been made in it of late which have increased its regulation from practically no load to full load without misses, but with what changes in construction I have not yet learned. A plant of about 750 horse-power, in four 120 horse power tandems, and two 60 horse power single engines, fitted with this governor and installed for the corporation of Belfast, Ireland, has been in use, driving Siemens & Halske dynamos, for something over two years with very satisfactory results. This plant has been described in our Gas Journals, as well as in a valuable article, "Gas versus Electricity for Power Transmission," in the November number of the *Engineering Magazine*.

Related to the question of regulation, and in reality an outgrowth of the attempts to secure it, are to be classed the various makes of multiple-cylinder engines, generally of the vertical type, which, with high speed, endeavor to overcome the ordinary irregularities. In small sizes some of these have met with success, but if attempted in large sizes it would seem that the number of bearing surfaces and the piston friction would be objectionable.

In the double-acting horizontal type this attempt has resulted in the tandem engine—a second double-acting cylinder placed in line behind the first, similar to a steam engine. This produces, at full load, an impulse to *every stroke*, gradually reducing, on the hit-and-miss principle, at one-quarter load to an impulse every fourth stroke (same as

COMPARATIVE CYCLES of GAS ENGINES.


FULL POWER.
STROKES 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26
SINGLE ACTING ENGINE ONE CYLINDER
AMERICAN DOUBLE ACTING ONE CYLINDER
AMERICAN DOUBLE ACTING TANDEM
SINGLE ACTING ENGINE TWIN CYLINDERS
THREE QUARTER POWER.
SINGLE ACTING ENGINE ONE CYLINDER
AMERICAN DOUBLE ACTING ONE CYLINDER
AMERICAN DOUBLE ACTING TANDEM
SINGLE ACTING ENGINE TWIN CYLINDERS
ONE HALF POWER.
SINGLE ACTING ENGINE ONE CYLINDER
AMERICAN DOUBLE ACTING ONE CYLINDER
AMERICAN DOUBLE ACTING TANDEM
SINGLE ACTING ENGINE TWIN CYLINDERS

single-acting full load). When this type is fitted with the Hartley governor it produces the extreme of close, economical regulation.

As beyond the province of the governor, dependence must be had in the flywheels for the two purposes of absorbing the sudden fluctuation or twinkle, due to the impulse of the explosion, and in street railway work, of carrying the engine over any undue instant increase in load. As for the former duty it may be safely said that for this work it is eliminated, the weight of the flywheel necessary on railway duty being in excess of the weight which would be required to merely absorb the impulse, if the engine were running on steady load. In this connection I have been enabled to make some very interesting comparisons, showing that the flywheels on the double-acting gas engine for street railway work are not unduly heavy, and no heavier than would be used upon a steam engine of the same character for the same purpose; the Lancaster engine indicating 130 horse power has 13,000 pounds of flywheel. This weight is 100 pounds of flywheel per horse power. Comparing this with steam engine practice, I had recent opportunity to examine one of the latest steam engine plants with tandem compound engines, made by the E. P. Allis Company, and using Siemens & Halske dynamos, direct connected. On each engine the flywheel and armature together weigh 82 tons; figuring this out, we have 104 pounds of flywheel per horse power, and taking a direct comparison from the dimension table of a well-known builder of Corliss engines, I find that an 18 x 36 engine, running 80 R. P. M., developing 129 indicated horse power at 1-5 cut off on 80 pounds steam, has a belt flywheel weighing 13,000 pounds, or 100¾ pounds per indicated horse power. The tendency in street railway practice appears to be towards increasingly heavier flywheels with a marked tendency to slower speeds.

I am tempted here to digress from the strict line of my subject to touch a point upon which there appears to be a very general misapprehension, by no means confined to the non-technical public. Almost the first question asked of a builder by a prospective purchaser is, "What consumption of gas do you guarantee per horse power." At first sight it is a thoroughly reasonable question—would be as applied to a steam engine—but on second thought the question should be, "What is the friction loss in your engine?" The consumption of gas per horse power is solely a matter of *mixture compression* and *cylinder temperature*, and all well known engines can be uniformly regulated in this respect. Thereafter the efficiency of the engine, as regards the difference between the indicated and actual horse power, is a matter of design and workmanship, to be decided by a mechanical expert almost by inspection. The comparative test by consumption per indicated horse power is absolutely misleading, and equally so is it by brake horse power, *unless* the mixture is known to be *exactly the same*. I should prefer to belt an electric motor to the driving pulley of each engine to be tested, and record the different amounts of power to move them at their rated speeds. This would give not only the comparative, but the actual friction losses. Allowing for these constant losses, the gas consumption should be *practically uniform in all*, and I would *depend upon the indicator* to show the way to make it so.

I think if superintendents having a number of engines on their lines could persuade their companies to provide them with indicator outfits, fit each engine to use it, which could be done at small expense, and periodically indicate them to see that they were not wasting gas through leaky valves, imperfect combustion, premature or late explosions, and other such losses caused by derangement of parts, they would not be called on to try and explain why an engine "used twice as much gas this month as last on the same work." Besides which, such attention would make a friend for the company and a standing advertisement. Gas engines, like other machinery, may go wrong with neglect or ignorant friendliness, and are well worth as much attention as we are now all giving to gas stoves, Welsbach lights and similar remunerative lines of effort.

Before leaving this digression I have a word to say in answer to the frequent complaint that the price of gas engines is high, beyond reason. There are perhaps 50 builders of gas engines of all kinds in this country. There is no combination among them and they are by no means all flooded with orders. There must be reason for the seemingly high prices, and they are readily found in the weight of metal required per horse power, the difficult nature of the casting, and the extreme quality of workmanship demanded by the high and sudden pressures to be dealt with and neutralized.

The last point to which I would draw your attention is the interest of gas companies in an electric light gas engine. The general trend of the thought in the engineering press and of the actual practice in our larger cities is towards the isolated electric light plant. There are even now many large stores and manufactories in our cities that provide their own service, and in the larger cities electric power is coming into use, supplied by the owner of the building and furnished in small units through motors to the various tenants.

The difficulties in the use of steam plants requiring skilled engineers, a considerable amount of valuable floor space, the necessity of handling solid fuel under many disadvantages, and the increased insurance risks, are very great obstacles to the full development of the isolated plant. The whole trend of the discussion of this subject indicates that a thoroughly reliable and successful gas engine, in units of from 15 to 200-horse power, will command a wide and increasing use and prove a source of material revenue to the local gas companies, which will receive thereby a remuneration from many buildings that are dead lines to them under existing conditions.

Pertinent to this view there was recently, in the *American Machinist*, an abstract of a report by Consul-General Frank H. Mason, at Frankfort, Germany, to the State Department, the concluding paragraph of which is well worth quoting verbatim.

"In a country where every detail of engineering and mechanics is so carefully studied as in Germany, especially in all that relates to the economy of service, it is certainly of the highest significance that, in electric lighting, the best German experts now give their unqualified verdict in favor of the 'block system;' that is, to small independent stations, worked by gas engines, instead of larger central stations, with dynamos driven by steam."

In conclusion, I will say that this paper was prepared very hurriedly, in response to a final attack by our worthy Secretary, and during a press of matters consequent upon the end of the year. Time did not permit of any research, and my object has been, not so much to present figures or data as to briefly relate what has been done, and to invite a general discussion of the gas power question.

Some Facts Relating to Gas and Electricity.

[A paper read by MR. J. F. SEAMON, Supt. United Light Company, Uniontown, Pa., before the Thirteenth Annual Meeting of the Ohio Gas Light Association.]

Twenty years have passed since electricity was heralded to the world as an antagonist to the interest of gas industries, and many of the claims of the original inventors of electrical apparatus as to the different applications which could be made of their product have been verified; but the application of it in a commercial sense as to economy for illumination has not fully met the claims of the inventors as made by them at the time of announcing their success.

An article of the New York *Sun*, dated September 16, 1878, graphically relating the progress of Edison's invention at Menlo Park, states that Edison has discovered how to generate electricity cheap, making it practically a substitute for illuminating gas; and, again, the same article states it has been computed that by Edison's process of generating electricity the same amount of light given by 1,000 cubic feet of carbureted hydrogen gas, and for which $2.50 is paid, may be obtained for from 12 to 15 cents. This statement, and many others of the same nature published at different times relating to the new invention, certainly had its effect upon the stockholder, gas engineer, speculator and gas manager, more especially upon the former and latter, putting them in a state of anxiety as to what effect the formidable competitor might have upon the business with which they were identified.

The announcement of Edison's invention affected all gas securities in this country and Europe. A special cablegram, published in the New York *Herald* of October 11, 1878, giving the situation of gas securities in London, among other things states, in gas securities there is

a perfect panic owing to the publication of Professor Edison's discovery for the distribution of electric light. Some gas stocks fell 12 per cent.

The organization of the electric companies followed after the publication of this discovery, and the stockholders of them were soon convinced that dividends were not so large as anticipated, and in many cases the results of the investments were exceedingly unprofitable. The investors never entertained the thought that the invention was an experiment, in its adoption as to commercial use, whereby the consumers could obtain that cheap light which was promised them by the result of the invention. The organization of companies continued, and the primitive investors of electric stations had it fully proven to them that the product they had anticipated to overthrow—viz., gas—was, contrary to their expectation, but rather stimulated by their competition.

The gas interests realized that more efficient means were necessary to manufacture their product, a utilization of their bye-products was necessary to lessen the cost, and also a better gas backed by a uniform supply and quality. While all these different points of manufacture of gas received attention, and were greatly improved, the efficiency of the different modes of applying the product of manufacture as an agency of light, heat and power, were quickly brought to the public's attention, on account of electric stations setting forth claims that their energy could be applied to the same use at a less cost. While it is true the same results are accomplished by the use of electricity as compared with gas, it now remains an open question which of the two products can be used with economy to obtain the above results.

With these preliminary remarks, I desire to call your attention to the central station as compared to the gas plant. We must recognize the efficient means which are applied to the different stages of gas manufacture, and while a gas plant's success to a great extent depends upon a correct registration of the product manufactured and sold, and the ample storage of the same, the same principles are applicable to a central station and the distribution of their product, which principles are now being adopted by electrical engineers in the design of them. It is necessary for the sale of any product to require some suitable means of measurement. As electric power is undoubtedly a product requiring the erection of a costly plant for its production, a unit of measurement is necessary, as well as an apparatus to record the units delivered to the consumer by the producer, and as appliances for recording electric energy, which register in ampere hours (the unit of quantity) and watt hours (the unit of work), are now being generally adopted, it thus makes electricity an equal competitor with gas when such devices are used for the measurement of their product. The writer's experience with the plant in his charge, when electric meters were applied to the consumer, found a reduction in the daylight load of 60 per cent., and the night load of 25 per cent., against that of the contract system. As electric stations received the benefit of this reduction, and where the revenue by the adoption of meters is not decreased, a majority of electric stations have been unable to lessen the cost of their product to the consumer on account of the variable load they are subject to, making it a necessity to have the machinery and dynamo capacity of sufficient size to carry them through the maximum hours of lighting, which covers an average of 3 hours in 24. As this machinery represents an investment of capital, and, considering the interest, depreciation, insurance and repairs, with no reduction in the cost of attendance, we readily see that in a majority of cases the cost of electricity to consumer is not lessened. The only material reduction would be that of the fuel and water account, which, under the peculiar conditions stated above, amounted to a saving of 20 per cent. In view of the facts stated, gas companies have been able to hold their share of the lighting business, and in many cities they have increased their output by the aid of efficient methods of applying their product as a source of illumination.

Comparing the storage battery with that of a gasholder, the electrical engineer in order to store his energy must incur a loss of not less than 20 per cent. of the energy stored, and must pay for his storage battery at the rate of $30 per horse power hour,[1] whether the capacity be large or small, but, on the other hand, the method of storing gas involves no appreciable loss of energy. A 50,000 cubic foot holder, at a cost of $7,000, would be 14 cents per cubic feet capacity, and $3.50 per horse power hour capacity. Assuming that the consumption of gas is 25 cubic feet per horse power hour, making a difference of 88 per cent. in the cost of storing an equal amount of energy by the means of a storage battery compared to that of the gasholder. And again, if we desire to compare the cost of installing a storage battery to that of a gasholder of equal capacity, we find that, allowing for leaks and condensation, and using the factor of 10 cubic feet per burner per hour, a holder of the size mentioned will furnish gas for 1 hour to 5,000 burners, at a cost per burner capacity of $1.40. To ascertain the cost of a storage battery of sufficient size to furnish energy to 5,000 16-candle power lamps at 50 volts, it is necessary to reduce to watt hours, adding 20 per cent. for loss of energy, which equals 300 kilowatts, which reduced to horse power hours, we get a product of 402 horse power hours; multiplying this by $30, the cost of a storage battery per horse power hour, we have a total of $12,060 for the cost of the installation of the same of equal capacity to that of a gasholder. It may be stated that storage batteries are confined to the direct current system of electric distribution, and that system is now being superseded by the adoption of the alternating current system in central stations, as the latter, on account of its high potential, covers a greater area in long distance transmission. With the comparisons just stated above, we find this important question of the storage of electric energy a costly one to install, not mentioning the fact of its cost of maintenance, and as the question of capital invested carries with it to a great extent the selling price of any commodity, we can see in this instance its direct application to electric stations, for it necessitates either a means of storage or a sufficient dynamo capacity to carry them through the maximum load.

The gas engine is now being recognized as an important factor for the generation of energy in electric lighting stations, and also in isolated plants, and as it is conceded that it is cheaper to distribute an equal amount of energy by the aid of gas mains, than by the method of electrical distribution, and, admitting this to be a fact, it remains for the gas engineer to set forth the practical economy which can be obtained through the agency of the gas engine. The writer calls your attention to one plant[1] in particular at Belfast, Ireland, where gas engines have been installed for the generation of electricity. The gas used was somewhat less than 24 cubic feet per electrical horse power, the test extending over a duration of six hours at full load. The electrical equipment in this instance consisted of four bi-polar dynamos, of 57½ kilowatts capacity each, and two similar dynamos of 26½ kilowatts capacity each, making a total of 380 electrical horse power.

In the large cities we find a number of isolated electric plants, and as it is necessary for the electrical engineer in the design of these installations to use a means of producing his energy at a minimum cost, it would suggest that a little enterprise on the part of the gas manager, and with the cooperation of the electrical engineer and the gas engine manufacturer, the means can be employed to extend the further use of gas as a productive power, thus closely identifying these branches of business, making them dependent to a certain extent upon the other.

In regard to gas as an illuminant as compared to that of electricity, the writer's experience has been, where gas dispelled that of electric light of equal luminosity, a saving of 71½ per cent. was gained in favor of gas, thereby benefiting the consumer. The Welsbach burner was used in this comparison, and the cost of renewing mantles in obtaining the above result is included. With the adoption of the Welsbach burner for gas illumination, it certainly was and now is, a serious obstacle in the general advancement of electricity for illumination where there is competition. And as the success of the prepayment meter plan is established, a combination of both burner and meter used would enable gas companies to obtain a trade that hitherto was an unknown factor to them. As a manager of a combined gas and electric plant, the writer recognizes whatever is to the consumer's interest, in the method of lighting, is to his interest also, and it only remains for him to give an uninterrupted service and a good quality of light at a minimum cost, using his best judgment in the economical running of his plant, and what additions or extension will be the most profitable to the interests he represents.

It may be thought the writer cherishes some prejudice against the electric light, but, on the contrary, I have a high admiration for it, realizing in many instances its necessity in illumination, and its utility as power in small units. I recognize that electricity has and will continue to be a benefit where it is produced *economically*, and we must also confess that it has benefited the gas industry by its competition, awakening the latter to a sense of duty for its own protection, and it is hoped by the writer that the electrical engineer will fully realize that he comes as near getting electricity direct from coal, through the agency of the gas engine and dynamo, as can practically be obtained at the present day.

In conclusion, I desire to comment upon the courage, stability and proper management of the gas interests in meeting their competitors, and thus holding their own. With the recent inventions of burners and appliances, and their adoption, the merits of gas have been put forth as

[1] N. W. Perry, in *Engineering Magazine*, Nov., 1896, "Gas versus Electricity for Power Transmission."

1. *Electrical World*, May 13, 1895.

an agency for light, heat and power, convincing stockholder and consumer that it is both profitable and economical in its manufacture and use.

A Curious Gas Explosion.

[A paper read by MR. IRVIN BUTTERWORTH, General Manager Columbus (O.) Gas Company, before the Thirteenth Annual Meeting of the Ohio Gas Light Association.]

At 1 o'clock, on the night of May 12th, 1896, a gasholder explosion occurred at the Ohio Institution for Feeble Minded Youth, situated 2 miles west of Columbus, O., severely burning several men, one of them fatally. While the cause of the explosion is not exactly "shrouded in mystery," yet it is almost incredible that an explosion should have occurred under the circumstances, which are as follows:

The Institution is equipped with a small coal gas works, including a single-lift holder, about 36 feet in diameter by 12 feet high, standing in a common brick tank, and supported by five columns connected at the top by girders. It is located at the foot of a hill sloping eastwardly; and, separated from it by a 12-foot driveway, on the east side is a brick coal house.

The following sketch (Fig. 1) shows a plan of the holder and its surroundings:

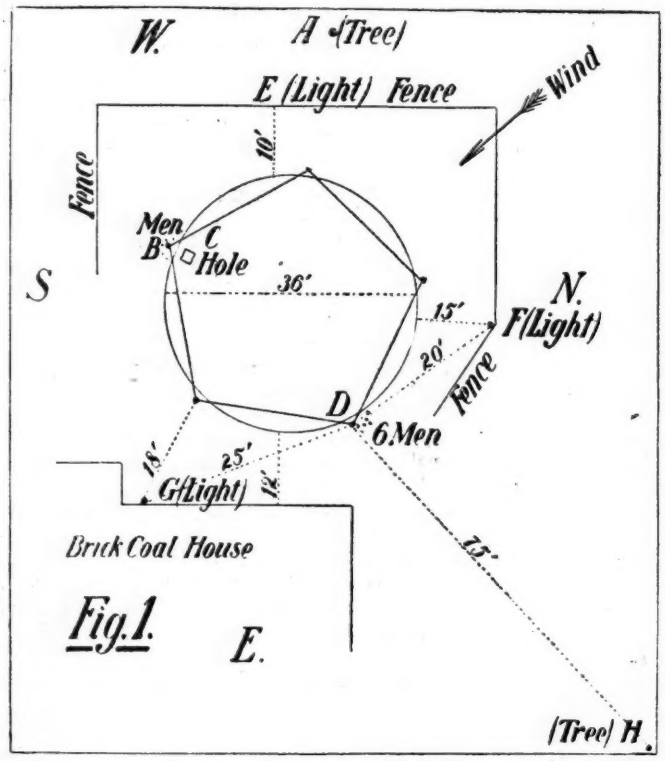


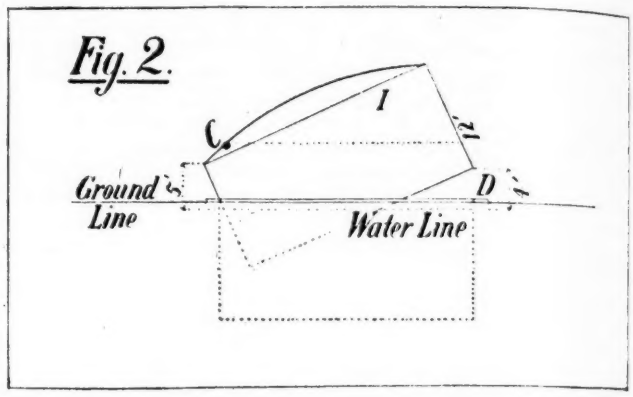
Fig. 1.

At about 3 o'clock on the afternoon of May 11th, when the holder was nearly full of gas, a severe wind storm arose from the northwest, as indicated by the arrow, blowing down a large forest tree which stood at the point *A*, and which fell across the southwest edge of the holder at *B*, knocking down the entire guide framing and tilting the holder, as shown in Fig. 2.

In the crash the guide roller carriage at the point *C* was torn off, pulling with it a portion of the crown sheet to which it was attached, and leaving an open hole in the crown about 8 inches square at the point *C*. It will be noticed that the bottom curb of the holder at the point *D*, almost opposite the point *C*, was raised about 4 feet out of the water in the tank, which was within about a foot of the top of the stone coping. The top of the side of the holder at *C* was depressed to within about 5 feet of the water.

The gas, of course, immediately escaped from the holder, impregnating the atmosphere to such an extent that its odor was distinctly noticeable at least half a mile from the works in the direction of the wind, which continued blowing severely for an hour or so, accompanied by rain. It finally subsided into a breeze, which prevailed for several hours, during all of which time the holder remained tilted in the position indicated in Fig. 2.

Immediately after the accident to the holder, the Superintendent of the Institution began the work of restoring it to its proper position, first stopping the make of gas and closing the valve on the inlet pipe to the holder, which pipe, it was afterwards found, had been broken by the



tipping of the holder, allowing the water to enter it and seal it off completely. A temporary wooden guide framing was hastily erected, consisting of five upright posts connected at the top by scantling, the structure being patterned after the iron guide framing that had just been demolished. Soon after this work was begun darkness came on, and three large oil lanterns were placed on top of posts about 10 feet high, at *E* and *F*, and at about the same height on the wall of the adjacent building at *G*. The light *E* was on the hillside, and was therefore probably 15 feet above the level of the stone coping, and about 10 feet in a direct horizontal line from the holder. The lights *F* and *G* were about 15 feet and 18 feet, respectively, in a direct line from the holder, and about 20 feet and 25 feet, respectively, from the point *D*, where the explosion afterwards occurred. These three lanterns were of an improved pattern, sometimes used for street lighting, the bottom and sides being perfectly air-tight, and the air supplying combustion descending through tubes from the top, where it is pre-heated by the flame below.

At the time these lamps were placed and lighted in the positions shown, about four hours had elapsed since the overturning of the holder, and the smell, and all other evidences of escaping gas had long since disappeared. No danger of an explosion was apprehended by the intelligent and extremely cautious Superintendent, who personally directed every part of the work of restoring the holder; and in fact no explosion occurred when these lanterns were lighted, nor for six hours thereafter. When the explosion did occur, these lanterns were not shattered nor extinguished, and it is almost certain that they had nothing to do with the explosion.

The work was continued without interruption until 1 o'clock of that night. The services of a transfer company from the city had been secured, and their derrick, equipped with block and tackle, had been erected at the point *B*, and hooks attached to ropes had been placed under the bottom curb of the holder at this point, for the purpose of thus raising the holder into position.

At the time of the explosion this had partially been done, the lower side at *B* having been raised about two feet, although the opposite side at *D* was not correspondingly lowered thereby, but, on the contrary, it remained in almost the same position as before, being held by the bottom curb of the holder bearing on the coping stone at two points at considerable distance on either side of the highest point *D*. It was seen, however, that when this highest point should descend, it, and especially the projecting guide roller on the curb, would strike against the stone coping. The Superintendent accordingly brought five men to that side of the holder to guide and force the bottom curb down into the tank as this side of the holder descended, although no striking or "jabbing" with bars was allowed for fear of injuring the holder; and, in order to prevent the projecting guide roller from still striking the stone coping, a section of this coping was loosened with iron crowbars and pulled back from the margin of the tank. It was while this was being done, and while the men were pulling upward on the opposite side of the holder, that the explosion occurred fully 10 hours after the original accident to the holder. Suddenly and without warning or apparent cause, a tremendous and blinding flash of fire puffed forth from underneath the raised edge of the holder. Its force was so great that the six men working at this point were thrown backwards and prostrate to the ground. The Superintendent himself, who was stand-

ing about 5 feet from the holder, was thrown about 15 feet, alighting on his back with his feet toward the holder. He turned over and was in the act of getting up when another explosion or puff occurred, equal in force to the first one, which sent him sprawling a second time. By this time his clothes were on fire, and all that probably saved him from a fatal burning was the heavy woolen overcoat which he had on. The workmen were not thus protected and all of them were severely burned, one of them dying the following afternoon. The Superintendent was severely burned about his hands and face, his hands being still in bandages at this time, 8 months after the occurrence.

The noise of the explosions was not great, although they were sufficient to awaken from their sleep some of the inmates of the Institution about 500 feet distant, who testify that they heard three separate and distinct explosions, or concussions, occurring in quick succession, about one second apart. The holder itself was not perceptibly damaged by these explosions, but the concussions raised it sufficiently to loosen the hooks that were attached to the bottom curb on the low side, and the holder was found after the explosions to have fallen lower into the tank at that point than it had been previously.

Workmen had been engaged during the evening in fitting a patch for covering the hole that had been torn in the holder at the point *C*, and in drilling holes for attaching the patch to the crown sheet; but at the time of the explosion they were not working on the crown. There were workmen, however, standing on the ground at this point handling the derrick and ropes, who testify that the puffs or flashes of the explosions issued through the hole in the crown, the first puff, at least, being followed by what seemed to be a decided inward suction of air through the hole. The explosions at this hole did no harm, as no one happened to be in the path of the flames that issued from it. The quantity of heat and flame accompanying the explosions was remarkably great, the grass and weeds on the opposite side of the driveway and the leaves on the tree *H*, fully 75 feet distant, being very perceptibly scorched and soon afterwards dying.

Now the most remarkable feature of this whole occurrence was not perhaps the fact that the gas or explosive mixture evidently remaining in the holder was ignited, athough this was strange enough; for although the careful Superintendent had prohibited smoking and was exercising every precaution, yet it is probable that a spark was struck from the crowbars of the men who were moving the coping stone, or was produced by the grinding or friction of the holder against the coping, notwithstanding everything was wet from the recent rain, which spark ignited the gas. But it must be remembered that at the time of the explosion the low side of the holder had been raised about 2 feet higher than when in the position shown in Figure 2, and much of the gas or explosive mixture in the space *I* had, therefore, escaped through the hole *C*, and the lower stratum of this gas or explosive mixture had thereby been removed still further, say 4 or 5 feet, above the points or places where sparks could have been produced in the manner suggested, so it is still very remarkable that the mixture should have been ignited.

The most surprising thing, however, in connection with this explosion, is that there should have been still remaining in the holder at that time, under the circumstances, any gas or explosive mixture whatever. Inasmuch as an explosion really did occur, it is, of course, easy and natural for us to claim that we would have known that the danger of one existed; but I am inclined to think that had your expert gas engineer himself been present and thoroughly familiar with all the facts and circumstances following the tilting of the holder, he also would have been among the number who "did not think it was loaded!" For, please bear in mind that the holder had been open to the air in two places, one of them a very large opening and the other, although not large, yet directly opposite to and somewhat higher than the large opening, making very favorable conditions for ventilation, and that a strong wind had been blowing for the 10 hours during which the holder had remained in this position. Of course, there was a large portion of the holder, represented in Fig. 2 by the space marked *I*, that was higher than the openings, in which space gas, being lighter than air, would naturally have remained for (one would think) only a short time; but the fact that it was evidently not dissipated and carried off, during the 10 hours following the tilting of the holder, by the combined effect of the law of the "diffusion of gases" and the ventilation induced by the vigorous air currents blowing over and around the holder and through the openings in it, is a sufficient justification, in my opinion, for the use of the word "curious" in the title given to this account of the accident.

Of course, comparatively little gas remaining in the holder would have been sufficient to form an explosive mixture; but the law of the diffusion of gases is so potent that the books tell us, for instance, if a jar containing the lightest gas is placed above one containing a heavy gas, and the jars be connected by a small tube of considerable length, or even if separated by a membrane, the two gases will intermingle completely, and "in a few hours" both jars will be found to contain both gases in the same proportion; and when we consider the much more favorable conditions for rapid and perfect diffusion between the gas and the air in the case of this holder, we find it difficult to believe that the proportion of gas in the space *I* had not been reduced at least below that necessary to form an explosive mixture. Almost as plausible would be the theory that oil or naphthaline deposits, the accumulation of years, were floating on the surface of the water under the holder, from which inflammable gases slowly evaporated after the tipping of the holder exposed these deposits to the air, thus keeping the space *I* filled with an explosive mixture. The ascending currents of these vapors could have been ignited by a spark produced as previously suggested, or the mixture itself could have been carried down to such spark by currents in the holder resulting from the wind or from the agitation of the holder by the workmen in their efforts to adjust it.

Whatever the cause and peculiarities of this and similar explosions, their phenomena are always interesting and instructive studies, and should impress the lesson of extreme caution on the mind of every gas works manager.

Advertising.

[A paper read by MR. E. S. TEMPLETON, Secretary and Treasurer of the Ashtabula (Ohio) Gas Company, before the Thirteenth Annual Meeting of the Ohio Gas Light Association.]

The present generation has seen many remarkable instances of the rapid introduction and sale of new articles of various kinds, especially of new proprietary medicines; articles unknown or not made six or eight years ago are now known and sold, not only in every corner of our own land but all over the world. This has been accomplished by skillful advertising—there must be merit in the article to be sold, but that is not enough; the merits must be made known, and the more quickly and generally this is done the more rapid the introduction.

A recent writer estimates that $300,000,000 are spent every year for advertising in the United States alone; single advertisers spend half a million each year for advertising, and get rich doing it; nine-tenths of successful business men engaged in selling anything advertise largely; any business where the fixed expenses are relatively large, and the cost of producing or selling each additional article or quantity relatively small, will stand large outlay for advertising.

The gas business will justify every intelligent effort to extend output. It is largely a business of fixed expenses—especially in a coal gas works; where superintendence, general office expenses, taxes, insurance, repairs, leakage, depreciation in mains and in many parts of the manufacturing plant, are increased little if any by increase in output.

In a water gas plant, of course, the cost of material is closely related to output; but in most coal gas plants this item is not such an important factor—the net income from by-products largely, and in some cases entirely, paying the cost of the coal, including freight and unloading.

Most of you have doubtless analyzed your expense accounts for a year, and realize how much your expenses are fixed—not dependent on output; if any of you have not, then do so at once. You will be greatly surprised at the result. In getting at cost of material, include, in cost of coal, the freight and unloading from the cars; add to this what may be termed your "by-product expense account"—that is, all expenses in marketing your by-products; from the total deduct what you receive from your by-products. The difference will show you the real cost of your material.

Another reason why the gas business will bear great effort and expense in advertising is that the new business sticks. If you increase your business a thousand dollars, or ten thousand dollars, this year, you may stop your special effort and your business will not go back; some of your customers may slip away to your electrical friend, but the natural increase, from your remaining customers, will usually make up the loss.

If you can increase your output $1,000 this year, and the cost of such increased output, outside of your advertising, is $200 it will leave you an increase in net profit of $800; that increase will stay with you the next year, and as you will be ready the following year to add another such sum to your net income, there is little danger of spending too much money to bring about such a result.

If the cost of advertising to bring about such a result cannot be paid

out of surplus earnings, would you not be justified in putting it to capital account, just as you would your extensions or enlargement of your works?

Through what medium should we advertise?

1. We should use the local newspapers. Probably a very small proportion of the readers of such newspapers are located along, or within reasonable distance of your mains, and it might at first sight seem a waste of money to use this medium, yet it will pay; for we will be cultivating the good will of the newspaper, will avoid many unjust slurs which seem to be considered funny, and we will be educating the general public so that next year, when one of these outsiders comes to look for a new house, the first question will be, "Is it piped for gas?" Landlords will find it harder to rent a house not equipped for using gas, and we will find less difficulty in getting people along our lines to connect up and pipe either old or new houses.

2. Pamphlets, booklets and circulars distributed in the neighborhood of your mains, or in sections where you think of laying new mains, will pay. This means can be used to keep in touch with your customers, to say things which you cannot take the time to talk about personally, and distribution can be made without extra expense when the bills are delivered or paid.

As an essential to successful advertising we must make good gas, give good service, and all at a fair price; without these there can be no lasting success. Then the truth should be told in our advertising as simply and strongly as we can do it or get it done. If we lie to our people they will lose faith in us, and then we are at a great disadvantage in our attempts to get further business or to keep what we have. Here, as in every other business, it pays to be fair and frank.

We may select a proper medium and prepare suitable matter, but much depends on the form in which the advertisement comes to the people. The form and the position in a newspaper are all important. Circulars and booklets ought to be attractive or they will go into the waste basket. Good paper, good printing and good illustrations add very much to our chances of a hearing. I have taken to keeping an advertising scrap book which I find useful; into it goes anything which is striking or suggestive in the way of advertising. The difficulty, especially for our small companies, is the expense of getting up illustrated booklets or pamphlets. The same booklet could be used by a hundred gas companies, and so reduce the expense of preparing attractive cuts and matter. Is it practicable to work out something of this kind through our Association?

All this is not enough; people procrastinate; they may know they ought to put in gas but they will put it off; the general advertising should be followed by personal work; first possibly by personal letters, but finally by personal interviews.

I have been struck with the effective manner in which the party politician works for his candidate; house to house canvasses are made; a complete poll list is made showing name, the occupation and party preference of each citizen; newspapers, pamphlets and letters are sent to voters, and in doubtful cases some party worker is sent for a personal interview. If we would put the same thoroughness into the business of selling gas we would have a far greater measure of success.

We could with profit have a canvass made of the houses along our lines, and have noted in a book, in some convenient form, the names of every person living or owning property along our mains or along streets where we contemplate laying mains. I would suggest that such a book should show whether the resident is owner or tenant; if a tenant, then who is owner; whether the house is piped; whether gas is used; if so, whether for light or fuel; if not, is such use contemplated? Is electricity used? If the street is not piped, show how many paces each house is from a corner. How is the house heated? etc.

With such a book you can work much more intelligently, thoroughly and cheaply. You know to whom to write or to send circulars, and the kind of letters to write or kind of circulars to send; you know who should be called on; if the owner or tenant calls upon you, you know about how much pipe will be required to reach him.

I believe no better investment can be made about the average gas plant than in thorough, systematic, intelligent advertising. I wish we could have some suggestions as to how we can co-operate to get effective advertising matter at a less cost than each one can prepare it for himself.

UNDER the payments made into the City Treasury of Cleveland, O., through the operation of the agreement between the two Gas Companies of that city and the authorities—the Companies agreeing to pay into the Treasury the sum of 6½ per cent. on their gross receipts for each year—the city has received $235,569.56.

[No. I.]

Some Details of the Displays at the Recent Gas Exhibition, Madison Square Garden, New York, under the Auspices of the Gas Industries Company.

Much courage was required to even carry the project of holding an exhibition of gas apparatus and appliances in America to the thinking stage, for such a display had never been attempted here on anything like a representative scale. It is true that creditable displays of gas apparatus, or, rather, the minor gas appliances, such as cookers, heaters, etc., had been made from time to time in different cities, during the times of holding in such localities the meetings of various Gas Associations, but these exhibitions were, while often interesting and always instructive, at best disjointed affairs. It may be, though, and it likely is, that the sporadic exhibition should be credited with having been the germ that culminated in the combined display of this month in Madison Square Garden. So, if courage were required to think about such an exhibition, it follows that conviction demanded a still stronger draught on the belief, and that certainty as to the outcome called for a goodly share of hope, in addition to courage and faith, on the part of the man who originated the thought and planned the scheme. Now, however, that the exhibition has been held and its teachings are in our minds, it is but just to say that Mr. E. C. Brown, who planned the exhibition, was well fortified by all the graces of hope, courage and faith; for it is to him, and to the Gas Companies of New York and Brooklyn, that the credit should be given of bringing off successfully the first American main exhibition in a metropolitan center, of gas and its possibilities over the adaptation of both to the *needs* of the everyday man. The exhibition, save in the single instance of a paucity of specimens of gas engine construction, was fairly representative of what can be accomplished by means of gas—for lighting, cooking and heating—and even the "short" display of gas engines, meager though it undoubtedly was, was sufficient to cause the "unprofessional" visitor to the exhibition to shrug himself over the thought that another motor power than that which depends on the raising of steam, by the crude combustion of solid sorts of fuel, was at the easy command of the engineer, be the latter stationary or otherwise. The fact is the exhibition was a success, and it was solid assurance to the gas man, even were such assurance wanted, that he and his business are more than ever in closest touch with everyday people and their needs.

Passing from the general stage of comment, in the instance of the exhibition, to the more particular one of what was there shown, it is proposed in this series of articles to refer briefly to some of the exhibits made. Beginning with gas construction, apparatus, fittings and the like, as being the "heaviest" parts of the show, and taking the exhibitors in alphabetical order, we find:

Messrs. Bartlett, Hayward & Co., of Baltimore, Md., presented a well arranged, orderly showing of some of their specialties. Prominent among these were a 12 foot meter head and index, and Mr. Hambleton's patent device for registering the quantities of naphtha supplied to retorts, in plants operating the Wilkinson or retort systems of manufacturing water gas, which ingenious apparatus acts to make the naphtha supply proportional to the quantity of hydrogen or blue gas admitted to the retorts. A 12-inch Berlin center valve and seal attracted inquiry, as did a fine specimen of "composite" tank of steel, brickwork and concrete for gasholders. This scheme, which is a product of the thought of the Company's clever engineer (Mr. F. Mayer), has for its object the doing away with metal bottoms in what may be termed overground tanks. A seal box for reversing the runs in "twin generators," a hydraulic main, with adjustable dip pipes, and mouthpieces with self-sealing lids attracted quite some attention. Other well finished apparatus shown was: 20-inch angle valves and fittings; generator seal valve or dip pipe; a well turned section of purifying box and cover; guide rollers and guide for a three-lift holder; full size riveted joint for heavy plate, as used in the holder tank now being built for the Philadelphia Municipal Gas Works; sections of joints in heavy plates, showing the difference existing between machine and hand riveting of 1¼-inch bolts; a section of headers and tubes of the "Economy Water Tube Boiler"—this apparatus we will describe at length in another issue of the JOURNAL—and a purifier cover lifter, governed by an ingenious arrangement for hoisting, lowering and moving the covers by means of rope transmission. The exhibit was altogether a mass well calculated to attract and hold the attention of the gas engineer.

The display of the Connelly Iron Sponge and Governor Company, 365 Canal street, New York, which was under the immediate, continued and careful charge of Mr. S. F. Hayward, was noteworthy for a neat working exemplification of how gas is purified by means of iron sponge.

The placing and operation of the boxes and material were shown in concise form. Other noteworthy features of the display were: An 8-inch Connelly automatic street main governor, the merits of which need no boost at our hands, whether the dimension be great or little; an 8-inch steam-jet exhauster, and a full size specimen of the Vajen-Bader "Smoke Protector," which is well worth the investigation of those whose men are at times compelled to work in an atmosphere overcharged with vapors not respirable for any length of time. The device has the seeming of cumbrousness, but in this instance we believe that the seeming is far from reality. It is bound to have a place in gas distribution appliances. Another feature of the Connelly Company's exhibit that attracted much attention was the Schmidt Electric Gas Lighter, the operation of which tends greatly to simplify the problem of the easy, sure and economical lighting of gas flames, especially in respect of the incandescent gas burner. Its sponsor for America, Mr. Adolph Frank, of New York, will shortly have something more to say about it.

(To be Continued.)

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

DURING the first week of the month delegates, representing several of the Gas Companies of New Hampshire, appeared before the Judiciary Committee of the New Hampshire Legislature, to dissent to certain features of a measure, fostered by Senator Howard, of Manchester, which scheme provides for the regulation of the price and quality of gas distributed in the cities and towns of the State by local boards, composed of the Mayors and Boards of Aldermen in cities, and the Selectmen of towns. Briefly stated, the bill requires the Mayor and Aldermen, or Selectmen, upon the complaint of 20 consumers of a Gas Company, respecting either the quality or price of the gas furnished, to notify the Company of the complaints and to name a time for a public hearing. The Mayor and Aldermen, or Selectmen, after such hearing, may order any reduction in the gas rate or prescribe any improvement in the quality of the gas as would be deemed in line with better service for the consumers from the testimony taken at the hearing. On the decision being promulgated, either party feeling aggrieved over the decision may appeal therefrom to the Supreme Court, within 20 days. In case the Company neglects or refuses to comply with the findings and order, it shall be denied the use of the public highways for its pipes, and such pipes shall be removed from the streets at the expense of the corporation. The remonstrances offered by the representatives of the Companies at the hearing were potent enough to cause a recommittal of the bill, with instructions to amend the same in certain particulars. When this shall have been done the measure will again come up for debate before the Judiciary Committee.

WE regret to report the death of Mr. E. Carl Breithaupt, whose clever and successful management of the Berlin (Canada) Gas Company, as its Secretary, Treasurer and Superintendent, had made him quite well known in Canadian gas circles. His death resulted from injuries caused by an explosion of gas in the Berlin plant.

AT the annual meeting of the Syracuse (N. Y.) Gas Company, the officers chosen were: Directors, Robert C. Pruyn, of Albany; Stephen Peabody, Emerson McMillin, Henry Seligman and A. C. Humphreys, of New York: W. L. Elkins, Jr., of Philadelphia, Pa., and F. W. Baker, John Dunfee, Charles M. Warner, W. S. Anderson, Thomas Ryan, William B. Kirk and H. S. White, of Syracuse; President, A. C. Humphreys, vice James J. Belden, who declined a re election; Vice-President, H. S. White; Secretary, F. W. Baker; Treasurer, Stephen Peabody; General Manager, T. Littlehales; Assistant Treasurer, J. J. Farrell; Assistant Secretary, H. B. Wilson.

MR. BAILEY, of Middlesex, has filed with the Clerk of the Massachusetts Senate a bill readjusting the salaries of the members of the Massachusetts Board of Gas and Electric Light Commissioners. It is proposed to fix the salary of the Chairman of the Commission at $4,000, the salary of the two other Commissioners to be at the rate of $3,500 per annum each.

AT the annual meeting of the Yonkers (N. Y.) Gas Light Company the Directors chosen were: Warren B. Smith, John K. Bangs, William W. Scrugham, Robert P. Getty, Harold Brown, James Slade, Alfred Jones, Samuel Babcock and Henry A. Robinson. The only change shown is the naming of Mr. H. A. Robinson to succeed the late Mr. James Bruce.

THE Philadelphia *Ledger*, of the 5th inst., said: "At a joint meeting yesterday of the Council's Committee of Law and Gas it was agreed to report negatively the ordinances introduced by Common Councilman Edwards, by request, providing for the sale of the city gas works for $20,000,000, $250,000 to be paid within 15 days after the passage of the ordinance, and the balance at stated intervals. Chairman James B. Anderson, of the Law Committee, presided. Mr. Dallas Sanders, representing the syndicate which is endeavoring to make the purchase, made an argument in favor of selling the works, in which argument he said that Chief Park, of the Bureau of Gas, had stated before the Gas Committee some days ago that it would take $2,500,000 to put the distributing pipes in good shape. Mr. Sanders also said that the syndicate which he represented was willing to expend $5,000,000 on an improved distribution system. Select Councilman Black said the gas works were not for sale, which statement was echoed by Select Councilmen Bryam and Clay. Common Councilman Simon moved to refer the ordinance to a sub-committee of 7, and his motion was amended by Mr. Upperman to make it a sub-committee of 5. Mr. Edwards moved to refer the ordinance negatively to Councils, and this carried by a vote of 24 to 3. The negative votes were cast by Messrs. James B. Anderson and Simon, Mr. Simon voting twice as a member of both committees.

THE proprietors of the San Francisco Gas and Electric Company have determined to pay dividends each month, as had been the custom of the Companies forming the consolidation prior to the merger. Owing to the work involved in arranging the transfer books and the issuing of the new stock certificates, it was not possible to declare and pay a dividend in February on January account, so it has been determined to declare a double dividend, payable in March, to cover the returns to shareholders for January and February.

GAS INSPECTOR MEEDS reports that the gas supplied during January by the Minneapolis (Minn) Gas Light Company averaged in illuminating power 24.84 candles. The average is the result of 25 separate tests.

THE new net rate of $1 per 1,000 cubic feet for fuel gas, which our readers will remember was instituted by the Directors of the New Haven (Conn.) Gas Light Company, at a meeting held January 5th last, has resulted in a most gratifying increase in the Company's output on fuel account. The text of the resolution ordering the concession is as follows: "After January 1st, 1897, gas used for heating, cooking or power, measured by a separate meter, shall be $1 per 1,000 feet, net."

THE Common Council of Buffalo, N. Y., has adopted a resolution directing the representatives of that city in the Legislature to urge the passage of a bill requiring the Gas Companies of Buffalo to sell their gas at a maximum net rate of 80 cents per 1,000 cubic feet. It is also stipulated that the gas sold shall be of at least 18 candle illuminating value.

AT the meeting of the Board of Directors of the Springfield (Mass.) Gas Light Company, held for the purpose of perfecting executive organization for the ensuing year, the officers chosen were: President, ex Lieutenant-Governor William H. Haile; Clerk, Edward S. Brewer; General Manager and Superintendent, S. J. Fowler. It was also resolved to put the gross selling rate at $1.40 per 1,000 cubic feet, prompt payment—on or before the 15th of the month—to entitle the consumer to a rebate of 15 cents per 1,000. The concession, which goes into effect April 1st, amounts to 15 cents per 1,000 from the ruling rate.

AT the annual meeting of the Hoosick Falls (N. Y.) Gas Light Company the officers elected were: Directors, Danforth Geer, Willis E. Heaton, C. A. Cheney, Walter A. Wood, Jr., and Salem H. White; President, Danforth Geer; Vice-President, Willis E. Heaton; Secretary and Treasurer, C. A. Cheney.

ACCORDING to the figures submitted by Superintendent W. P. Knowles, of the Richmond (Va.) City Gas Works, to the Committee on Light of the Richmond City Council, the expense of operating the plant for 1897 will amount to $131,300. The item allotments are: Pay rolls, $58,000; coal, $24,000; oil, $35,000; extensions, $6,500; expense, $6,500; lamplighting, $1,800. The disbursements last year on gas works account amounted to $142,377.61, of which sum $12,234.45 went into extensions.

THE final papers transferring all the properties of the Davenport (Iowa) Gas Company to its successor, the Consolidated Gas, Electric Light and Steam Heating Company, of Davenport, have been recorded.

THE authorities of Mount Sterling, Ky., are considering the advisability of taking over the plant of the Mount Sterling Gas Light Company for operation on municipal account.

THE Massachusetts State Senate has rejected the bill introduced by Senator Gallivan to prohibit gas companies from demanding deposits on gas meters.

THE following is from the Kansas City (Mo.) *Journal*, dated Jan. 29, 1897: "The Missouri Gas Company, through President R. M. Snyder, presented to the Council last night an ordinance, fathered by Ald. Morrison, authorizing the Company to convey the plants of the Missouri Gas Company and the Kansas City Gas Company to a third Company hereafter to be organized. The ordinance, which is as follows, was referred to the Gas Committee:

"'*Whereas*, It is desired, for the purpose of economy in the construction, extension, maintenance and operation thereof, to convey the respective gas plants, property and privileges of the Missouri Gas Company and the Kansas City Gas Company, and to vest the same in one company, and thereafter to extend, maintain and operate said gas plants and properties with the terms, provisions and conditions contained in the franchise ordinances under which said gas plants are now operated and maintained; and

Whereas, The objects and purposes of granting the franchise to R. M. Snyder and others, the incorporators of the Missouri Gas Company, to construct and operate a gas plant, have been accomplished, and this city is now assured for all time a good quality of gas at a rate not to exceed $1.10 per 1,000 cubic feet, with a reduction of 10 cents per 1,000 cubic feet on all bills paid on or before the 10th day of the month following that in which the gas was consumed, and the proper measurement, quality and candle power of the gas are guaranteed by the provisions in said ordinances, empowering the city to appoint inspectors or measurers of gas, and to charge the cost of such inspection to the Gas Company; and

"'*Whereas*, It is and was contemplated and provided by the franchise granted R. M. Snyder and others, and assigned to the Missouri Gas Company, and also in the franchise subsequently granted to Milton J. Payne and others, and assigned to the Kansas City Gas Company, that said gas plants and properties may be united and merged into one plant, with the consent of the city;

"'Therefore, be it ordained by the Common Council of Kansas City:

"'Section 1. That the consent of Kansas City is hereby granted unto the Missouri Gas Company and the Kansas City Gas Company, and said Companies and each or either of them are hereby authorized to sell, transfer and convey their respective gas works, franchises and property of every kind to a corporation to be organized under the laws of this State, its successors and assigns; and any such corporation, its successors and assigns, is hereby authorized to acquire, purchase, own, hold, sell, convey, mortgage, encumber, manage, operate and maintain such works, franchises and properties, in all respects and to all intents and purposes as a single united property, plant and system; but such corporation, its successors and assigns shall be bound in the extension, operation and maintenance of said united plant and property by all the terms, provisions and conditions contained in the respective franchise ordinances under which said gas plants and properties are now being operated and maintained, and shall furnish and keep in repair fee of cost or expense to the city and gas consumers, all gas meters required for measuring gas, and all reasonable cost and charges of inspection or measurement of gas shall be paid by such corporation, including the salary or salaries paid by the city to the inspector or inspectors of gas, and the cost of equipment of said inspector's office."

THE following communication, which explains itself, is referred to our advertisers for their consideration:

JUNEAU, ALASKA, Jan. 29, 1897.

To the Editors AMERICAN GAS LIGHT JOURNAL: I am in want of a fuel gas plant for a town of 3,000 inhabitants, and have the money ready to pay for it. Won't you kindly do your advertisers and myself the favor to request your *fuel* gas apparatus manufacturers to place themselves in correspondence with me. Kindly send me your bill for postage outlay, and for a year's subscription to your paper, and oblige, Yours truly, J. T. JONES.

IN a postscript, Mr. Jones adds: "Don't want illuminating gas. Have too much "native electricity and daylight."

THIS inquiry is a bona fide one, and any of our advertisers who wish to put themselves in communication with Mr. Jones can be assured that their messages will reach him if the same are addressed, "J. T. JONES, Juneau, Alaska."

THE contract for the new power station to be erected for the New York, New Haven and Hartford Railroad Company, at Berlin, Conn., has been let to the Berlin Iron Bridge Company, of East Berlin, Conn. The building is to be 110 feet in width and 200 feet in length, divided into two equal portions, one side to be used for a boiler room and the other for an engine and dynamo room. The engine and dynamo room is to be equipped with a runway and a 35-ton traveling crane. The whole framework is to be of steel, the side columns being inclosed by brick walls; and when the structure is finished and the apparatus is installed, the proprietors assert that it will be one of the most complete, expensive and best central stations in the world, as no pains or expense will have been spared to make it a model.

WE understand that the plant of the Carson City (Nev.) Company is to be remodelled, the proprietors having determined to install a generating apparatus of the Van Syckel type.

THE Oakland (Cal.) Gas Light and Heat Company proposes to extend its distributing system to the adjoining borough of Emeryville.

THE proprietors of the Athol (Mass.) Gas and Electric Company are considering the advisability of recapitalizing that corporation.

THE plant of the New London (Conn.) Gas Light Company will soon be transferred to the site on which the electric lighting plant of the Oneco Manufacturing Company is located. This will involve much new construction, and the scheme of the latter we believe includes the building of a gasholder. Evidently President Terry and Manager Purinton have determined to put the gas supply of New London in such shape that the errors of those who formerly controlled it will speedily be forgotten.

MR. EDWARD TETLEY, as assignee of the Winnepesaukee Gas and Electric Lighting Company, of Laconia, N. H., is now in full charge of its properties and business, under the instructions of the court having jurisdiction.

AT the annual meeting of the Brattleboro (Vt.) Gas Light Company the officers chosen were: Directors, H. D. Holton, O. D. Esterbrook, J. L Martin, G. C. Averill and C. H. Thompson; Clerk and Treasurer, C. F. Thompson.

THE current month will mark the retirement from active business life of Captain James Williams, since 1867 the Superintendent of the Johnstown (Pa.) Gas and Water Companies. Owing to advancing years and consequent infirmities, the familiar face and form of the genial Captain have been missed from the annual meetings of the American Gas Light Association, but those of the fraternity who have met him on his own heath marvel at the activity and interest displayed by this veteran, now close to his 80th year. Mr. Williams, who is a native of Wells by-the-Sea, Norfolk, England, during his boyhood days was the friend and associate of Lieutenant Fred. Marryat, son of the famous novelist, Captain Marryat, whose country seat was at Wells. His inclinations, and those of the Lieutenant, ran in the same channel, and both "took to the sea." For 17 years Mr. Williams followed the sea, eventually giving up that vocation to enter the service of the Crane Iron Company, at Catasauqua, Pa., under the famous ironmaster, Mr. David Thomas. During his connection with the Crane Company he was an associate of the Messrs. Fritz, William R. Jones and others who became famous in the practice of metallurgy. Mr. Williams removed to Johnstown soon after the inception of the Cambria Iron Works at that point, and for 15 years was in their service in different capacities—foreman of boiler shops, in charge of puddling department, rolls, etc. In 1867 he was placed in charge of the gas and water works of Johnstown, from which time to the present he has been the active executive of these combined interests. Both Companies have prospered and thrived under his care, and those in charge of their affairs have, with a view of availing themselves of the Captain's wise counsel and advice, retained him in their employ in a consulting and advisory capacity. The gas and water works in Johnstown and the name of James Williams are inseparably connected, and the Captain's face will no doubt beam pleasantly on the "boys" whose paths of travel lead them to Johnstown. The management have also relieved from active service Mr. William L. Shyrock, whose service as bookkeeper for the two Companies is contemporaneous with that of Mr. Williams as Superintendent. The Directorates of these Companies have done well in placing themselves in position to command the services of both gentlemen in case of necessity. Mr. Anderson H. Walters, for the past 15 years connected with the Companies, first as Collector, and since 1890 as Secretary and Assistant Superintendent, will fill the dual positions of Secretary and Superintendent for both organizations. Mr. Emery West will succeed Mr. Shyrock as bookkeeper, and the department of meter inspection, reading and collection will be in charge of Mr. Walter Dowling.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.
PACIFIC COAST GAS ASSOCIATION.
TEXAS GAS AND ELECTRIC LIGHT ASSOCIATION.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 Cents.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, FEB. 15, 1897.

The Market for Gas Securities.

Quotations for city gas shares show a tendency to lower figures, and the trading in them was comparatively light towards the end of the week. The closing of the Exchange today (Friday) obliges us to base our references on the closing prices of yesterday. Consolidated was 147 bid, offered at 149.

The situation at Albany over the gas rate question is considerably befogged, but no one as yet has any good reason for asserting that any particularly drastic measures will be enacted in that instance. The Committee on Gas, Water and Electricity, of the Assembly, and the Committee on Miscellaneous Corporations, of the Senate, have arranged for a joint hearing next Thursday on the "merits" of the Cantor-Laimbeer dollar gas bill, and it looks that the session will be well worth attending.

Meantime, Senator McNulty, the Kings County lover of free silver, has turned his attention to helping along the matter of "free gas," which he believes might be attained under municipal operation of gas works. One of his aides is Edward M. Grout, who, running some time ago as the Democratic candidate for Mayor of a Democratic city (Brooklyn), was soundly beaten by his Republican opponent, Mr. Wurster. McNulty and Grout are decidedly in favor of the Pavey bill, which proposes to vote $10,000 to a committee of the New York Board of Aldermen for the purpose of investigating the desirability of putting the gas supply under municipal control. Grout no doubt thinks he may have a look in with the $10,000—he is a lawyer, and was formerly the partner of that eccentric judge, Mr. W. J. Gaynor.

It is gentlemen of the stripe above indicated who are so anxious to save other peoples' money, and they are the ones whose disinterested (?) efforts over the gas rate question are likely to ultimately result in causing it to remain for the present at the ruling figure. It is yet too early in the game to say what the result will be, but it seems to us that the Aldermen won't get the $10,000. Other New York city shares are dull, notably East River common. Brooklyn Union bonds are strong, Chicago gas shows no change from last week, Baltimore Consolidated is steady, and it looks a purchase at the quoted rates. Lacledes, which are dull and lower, also seem to afford a fair chance for profit at the market.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

FEB. 15.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,430,000	100	147	149
Central	500,000	50	195	..
" Scrip	220,000	..	100	.
Equitable	4,000,000	100	230	..
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	225	.
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
Northern	150,000	50	85	..
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	44¾	45¼
Preferred	2,000,000	100	74	76
Bonds 1st 5's	3,500,000	1,000	104½	108½
" 1st Con. 5's	1,500,000	..	95	96
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	80	82
Preferred	5,000,000	100	107	109
Bonds, 1st Mortgage, 5's	1,500,000	1,000	108	..
Yonkers	299,650	50	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	89	91
" " Bonds (5's)	15 000,000	1,000	108½	109
Bay State	15,000,000	50	11¼	12
" Income Bonds	2,000,000	1,000	..	35
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	..	85
2d " " "	3,000,000	1,000	70	72
Buffalo Mutual	750,000	100	125	..
" Bonds	200,000	1,000	95	100
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co	25,000,000	100	77⅛	77¼
Chicago Gas Lt. & Coke Co. Guaranteed Gold Bonds	7,650,000	1,000	94	94¼
Columbus	1,069,000	..	68	70
1st Mortgage	1,085,000	..	..	96
Consumers, Jersey City	2,000,000	100	..	75
" Bonds	600,000	1,000	100	102
Cincinnati G. & C. Co	8,500,000	100	200¼	200⅝
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	1,000,000	100	61½	62½
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Detroit	4,000,000	..	22	..
" Con. Bonds	4,312,000	..	78	78½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	82	84
" Bonds	2,000,000	..	91	93
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	130	135
" Bonds, 6's	2,650,000	..	105	107
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind	1,000,000	100	84	88
Bonds	1,000,000	1,000	92	94
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	23	24
Preferred	2,500,000	100	70	75
Bonds	9,034,400	1,000	93¾	94
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co	1,000,000	..	98	98
Bonds, 6's	4,000,000	..	123	..
New Haven	1,000,000	25	225	..
Oakland, Cal.	2,000,000	..	53½	54
" Bonds	750,000	..	..	..
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	88	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10.000,000	100	97¾	98¼
St. Paul Gas Light Co	1,500,000	100	67½	70
1st Mortgage, 6's	650,000	..	84	87
Extension, 6's	600,000	..	..	..
General Mortgage, 5's	2,400,000	.	88	90
Syracuse, N. Y.	500.000	25	..	..
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	59	61
Bonds, 5's	3,556,000	.	90	91
Wilmington, Del.	500,000	50	180	182

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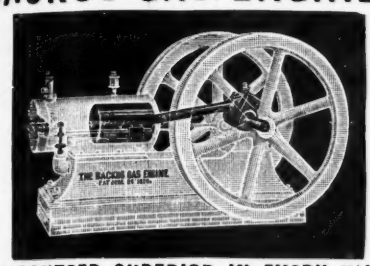

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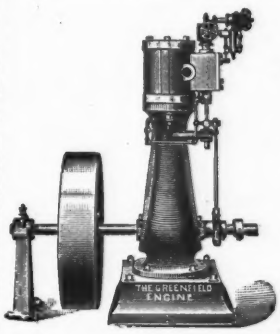

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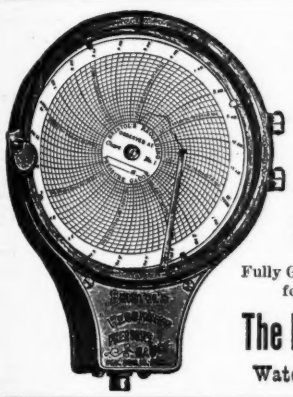

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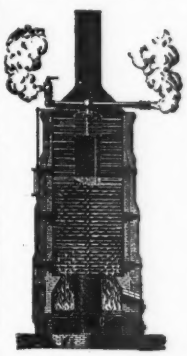

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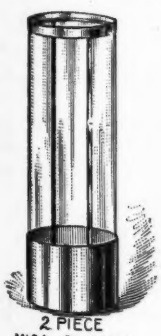

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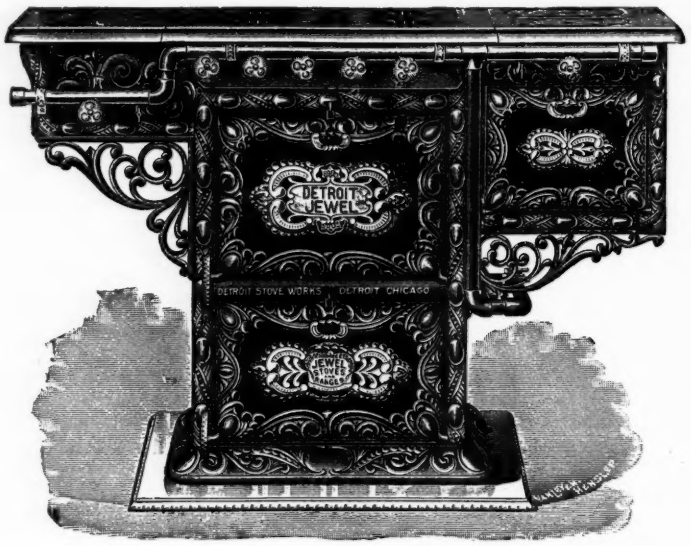

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INJUNCTION ISSUED AGAINST INFRINGERS.

On September 23d the United States Circuit Court for the Southern District of New York granted an injunction restraining and enjoining the further infringement of our Welsbach patent. READ IT.

UNITED STATES CIRCUIT COURT,
Southern District of New York.

WELSBACH LIGHT COMPANY,
vs.
A. LIEBES.
} IN EQUITY.

The President of the United States,

To A. LIEBES, and his servants, agents, attorneys and workmen, GREETING:

WHEREAS, It has been represented to us in our Circuit Court of the United States for the Second Circuit and Southern District of New York, that Letters Patent of the United States No. 438,125, were issued in due form of law on the 7th day of October, 1890, to Carl Auer von Welsbach, assignor of the complainant, then known as "Welsbach Incandescent Gas Light Company of New Jersey," and that the complainant herein is the owner of said Letters Patent, and that you, the said A. Liebes, have infringed the rights secured by the aforesaid Letters Patent, by making, using and selling to others to be used, incandescent devices for gas burners, embodying and containing the invention and improvements described and claimed in said Letters Patent No. 438,125.

NOW, THEREFORE, We do strictly command and enjoin you, the said A. Liebes, and your attorneys, agents, servants and workmen, under the penalties which may fall upon you in case of disobedience, that you forthwith and forever desist from directly or indirectly making, or causing to be made, delivering, vending, or causing to be sold, offering for sale, using, or causing to be used in any manner, any incandescent devices for gas burners, like, or similar to those which you have heretofore made, used or sold, containing or embodying the invention and improvements described in said Letters Patent No. 438,125, and claimed in the claim thereof, and from counterfeiting or imitating the said invention or improvements or any part or parts thereof, and from in any manner or way whatsoever, violating or infringing the said Letters Patent No. 438,125 and the claim thereof, and from doing, or causing to be done, any other act or thing whatsoever in infringement of the said Letters Patent No. 438,125.

WITNESS, The Honorable Melville W. Fuller, Chief Justice of the United States, at the City of New York, in the Southern District of New York, this twenty-fourth day of September, A. D., 1896.

(SEAL) JOHN A. SHIELDS, Clerk.

(Endorsed) U. S. Circuit Court, Southern District of New York, in Equity.—Welsbach Light Company vs. A. Liebes. Injunction.

A Copy of a Writ of Injunction this day issued out of my office. JOHN A. SHIELDS, Clerk.

We shall proceed against all infringers; manufacturers, dealers and users being equally liable to injunction and damages. The decree of the court awarding the injunction also awards profits and damages. Do not be misled or deceived by guarantees offered by infringers, as such guarantees will not protect you against suit, injunction and damages. For your own protection see that you get the genuine Welsbach light. All other incandescent gas lights are infringements.

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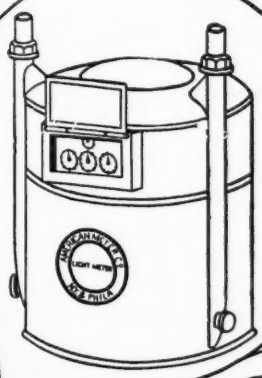
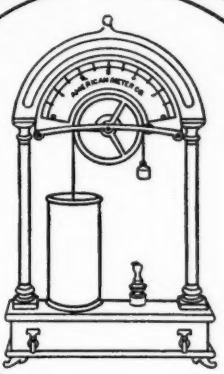
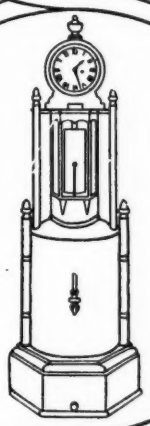
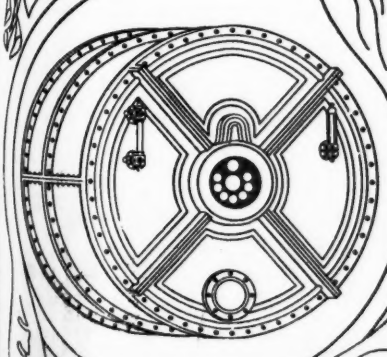








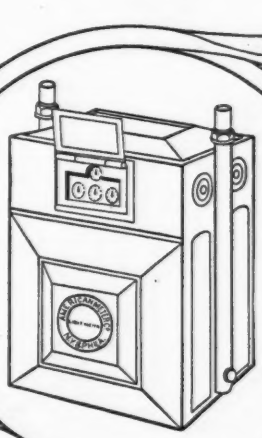
PUBLIC LIGHTING TABLE.

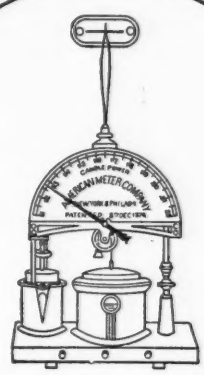
MARCH, 1897.

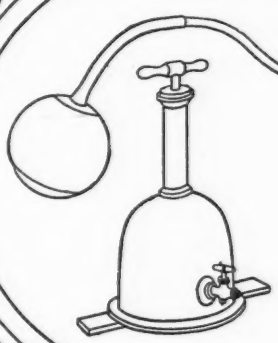
Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Mon.	1	6.20 PM	5.30 AM	5.30	5.45
Tue.	2	6.20 NM	5.30	5.30	5.45
Wed.	3	6.20	5.30	5.30	5.45
Thu.	4	6.20	5.30	5.30	5.45
Fri.	5	6.20	5.30	5.40	5.35
Sat.	6	6.20	5.30	5.40	5.35
Sun.	7	9.30	5.20	5.40	5.35
Mon.	8	10.30	5.20	5.40	5.35
Tue.	9	11.30	5.20	5.40	5.35
Wed.	10	12.30 AM	5.20	5.40	5.35
Thu.	11	1.20 FQ	5.20	5.40	5.35
Fri.	12	2.00	5.20	5.50	5.20
Sat.	13	2.40	5.20	5.50	5.20
Sun.	14	3.20	5.10	5.50	5.20
Mon.	15	3.50	5.10	5.50	5.20
Tue.	16	4.20	5.10	5.50	5.20
Wed.	17	No L.	No L.	5.50	5.20
Thu.	18	No L. FM	No L.	5 50	5.20
Fri.	19	No L.	No L.	6.00	5 10
Sat.	20	6.40 PM	9.50 PM	6 00	5.10
Sun.	21	6.50	11.10	6.00	5.10
Mon.	22	6.50	12.30 AM	6.00	5.10
Tue.	23	6.50	1.40	6.00	5.10
Wed.	24	6.50 LQ	2.40	6 00	5.10
Thu.	25	6.50	3.30	6.00	5.10
Fri.	26	6.50	4.10	6.10	4.55
Sat.	27	6.50	4 40	6.10	4.55
Sun.	28	6.50	4.50	6.10	4.55
Mon.	29	6.50	4.50	6.10	4.55
Tue.	30	6.50	4.50	6.10	4.55
Wed.	31	6.50	4.50	6.10	4 55

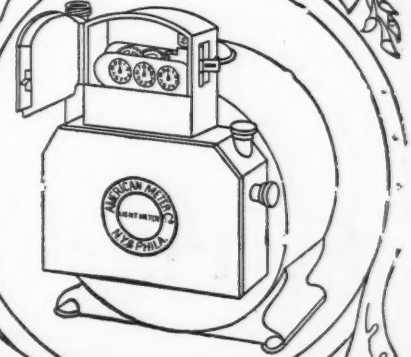
TOTAL HOURS LIGHTING DURING 1897.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	233.00	January	423.20
February	187.20	February	355.25
March	202.00	March	355.35
April	170.40	April	298.50
May	163.00	May	264.50
June	140.40	June	234.25
July	151.40	July	243.45
August	167.30	August	280.25
September	174.40	September	321.15
October	200.00	October	374.30
November	205.20	November	401.40
December	220.10	December	433.45
Total, yr.	2216.00	Total, yr.	3987.45









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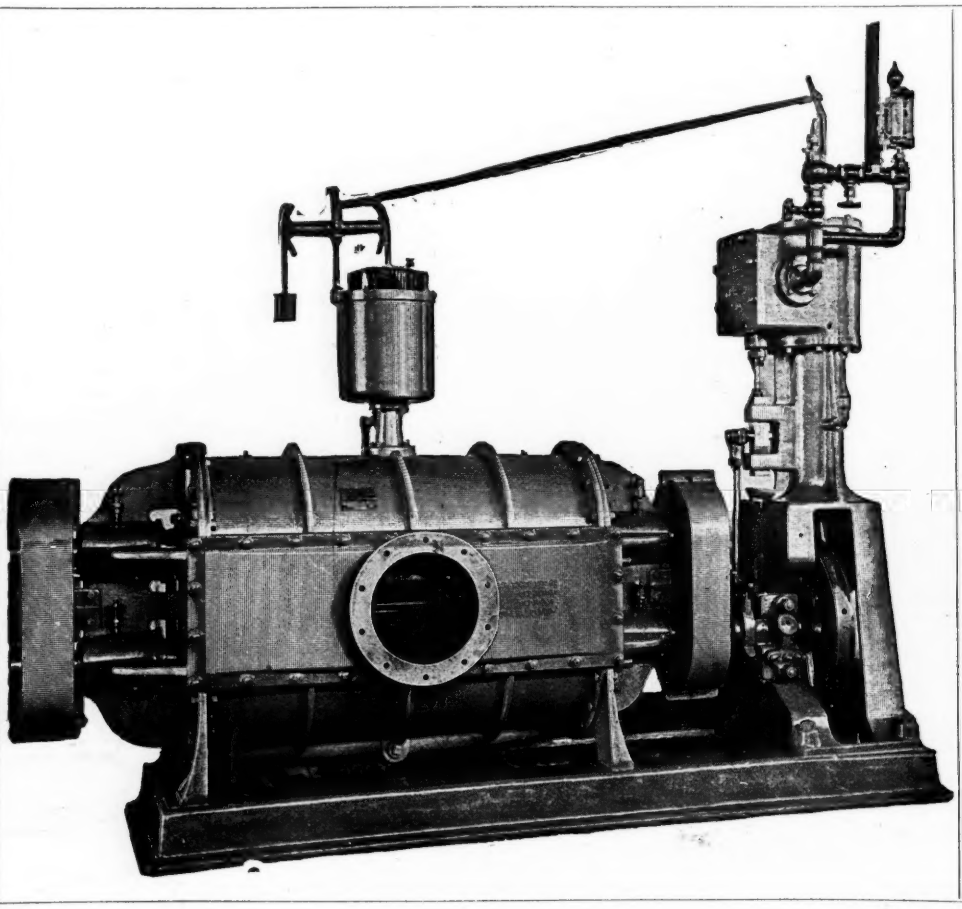

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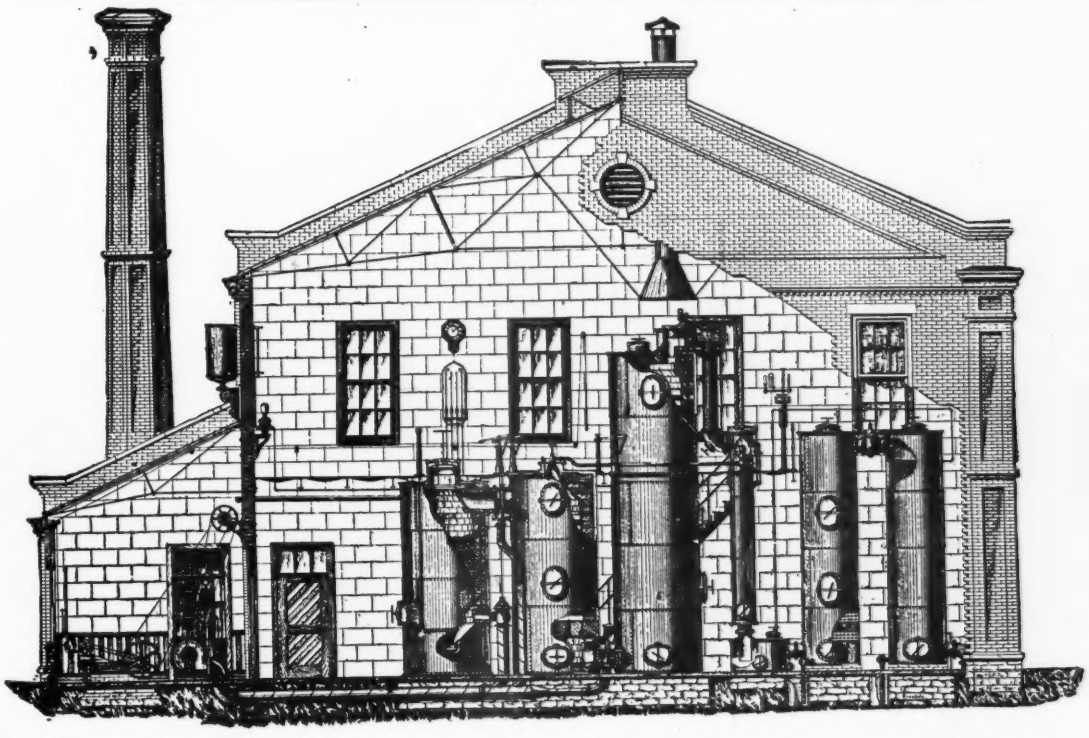

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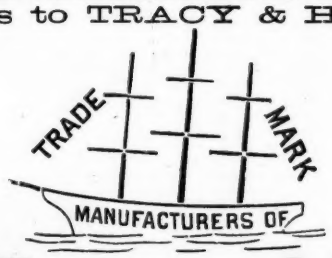

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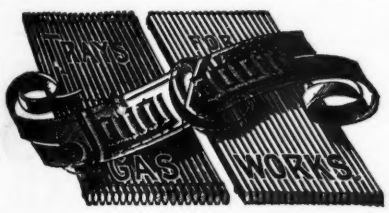

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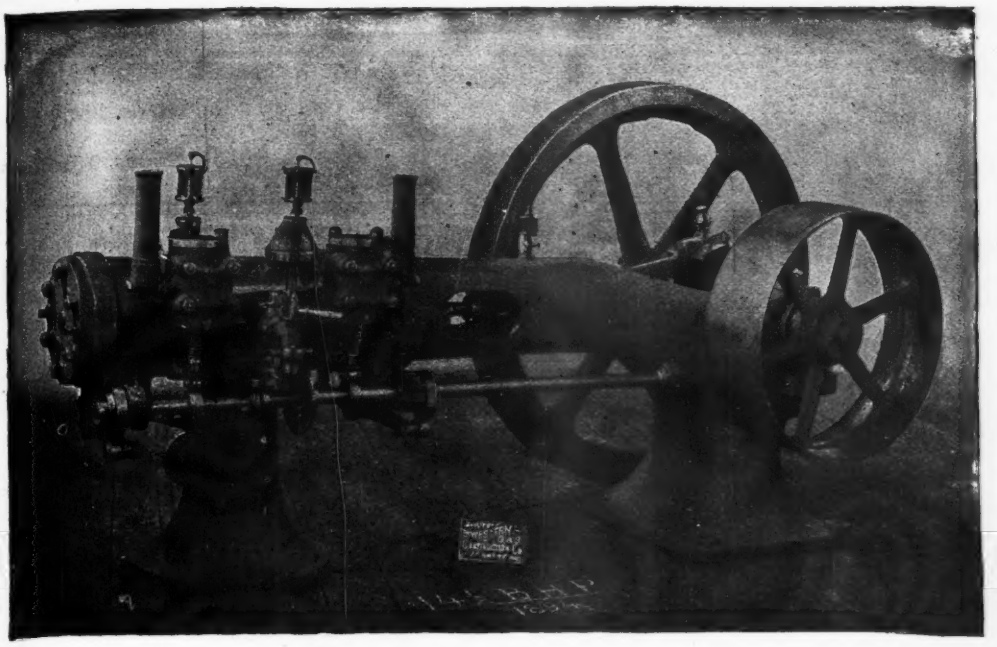

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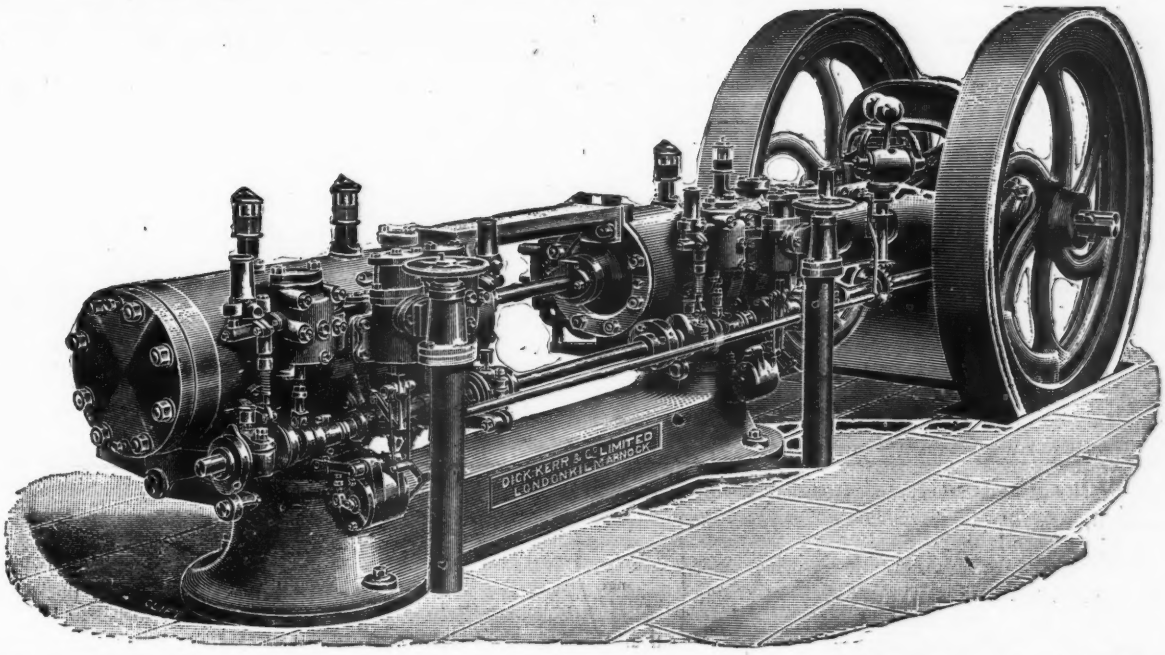

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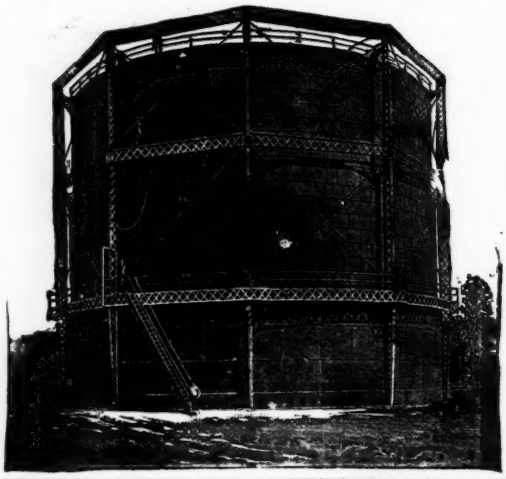

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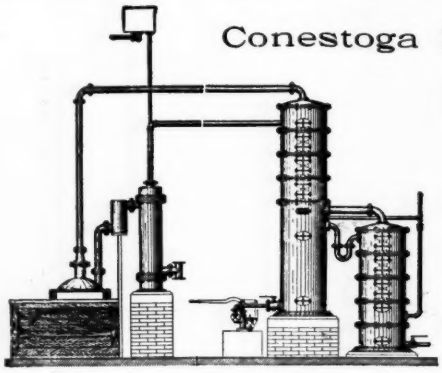

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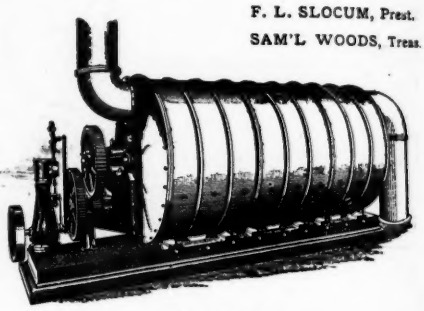

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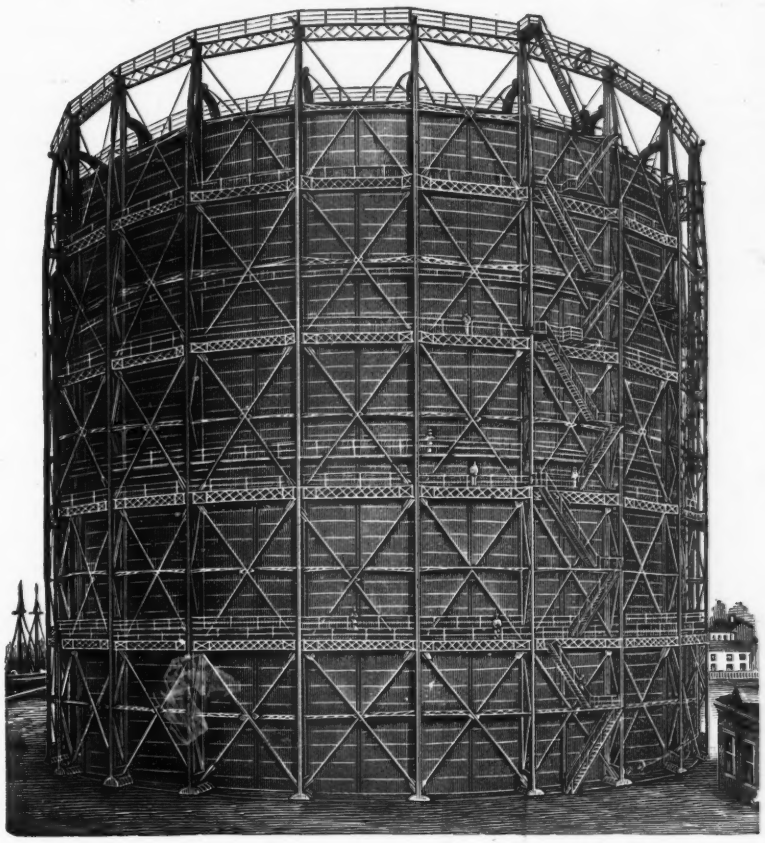

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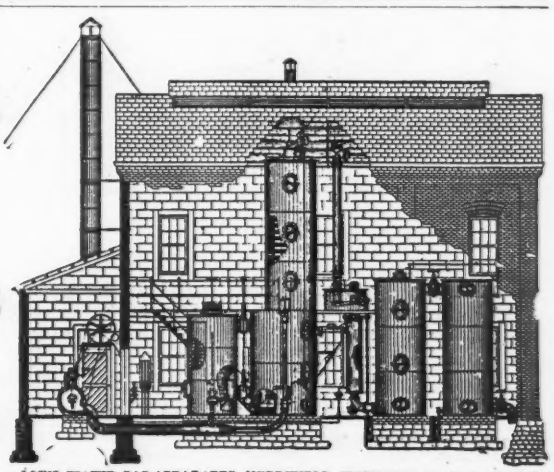

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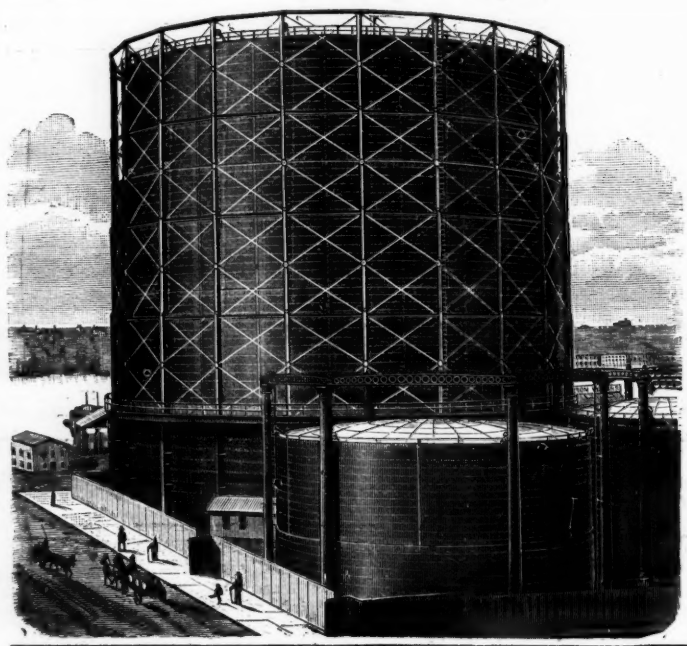

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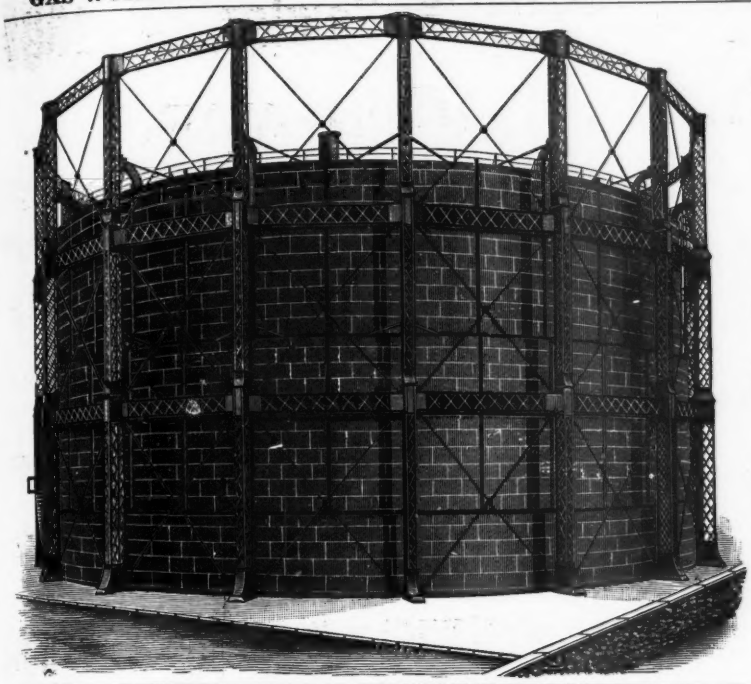

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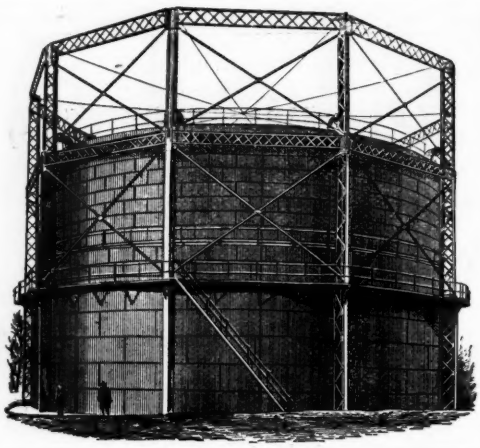

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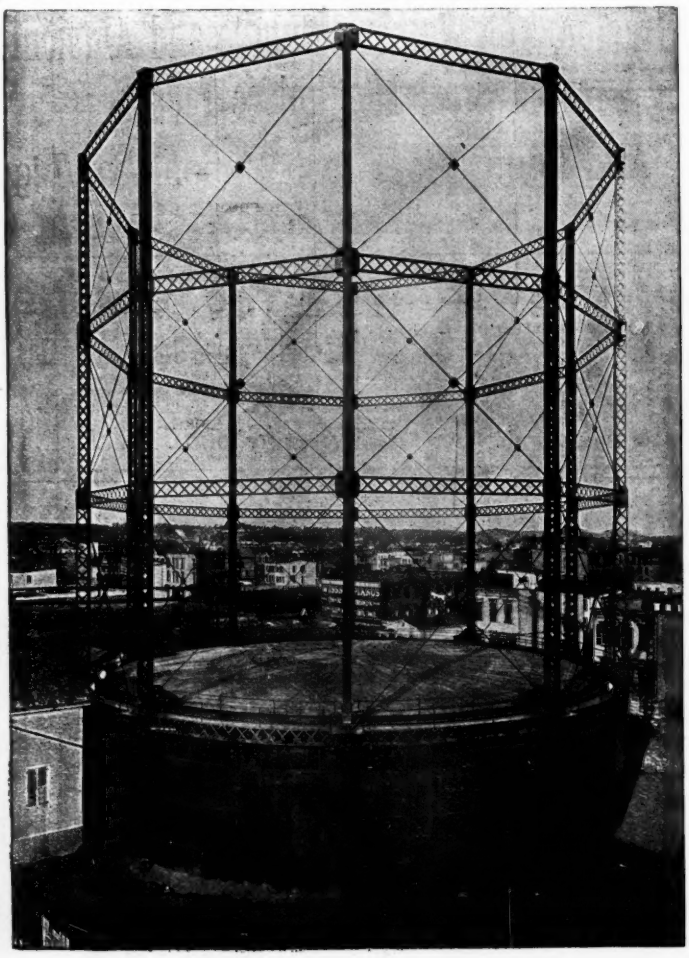

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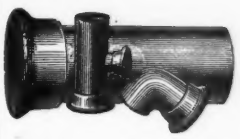

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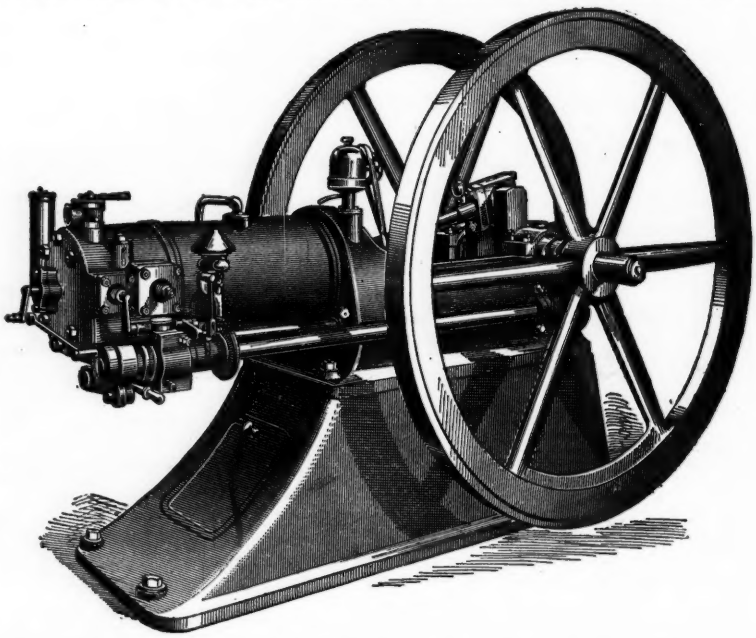

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The gas engine history of the past proves that all competitors have recognized this fact by becoming imitators.

Since its advent the "Otto" engine has been illustrating mechanical improvement without alteration, while others have been offering alterations as improvements.

The experience of the past shows that it requires years to determine the real merits of a gas engine, and that nearly all new gas engines prove failures. **The fittest survive, and the only safe thing to do** in selecting a gas engine is to buy what the tests of practical use, through a long period of time, have proven to be the best.

The Practical Tests of a Quarter of a Century have Demonstrated that the "OTTO" Stands To-day Unrivaled

For simplicity of construction and grace in design; for general reliability and ease of management; for quiet and smooth running qualities; for efficiency and low gas consumption; for regularity of speed and close regulation of power.

"OTTO GAS ENGINE WORKS," Inc., 33d & Walnut Streets, Phila., Pa.

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